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WAR MACHINE

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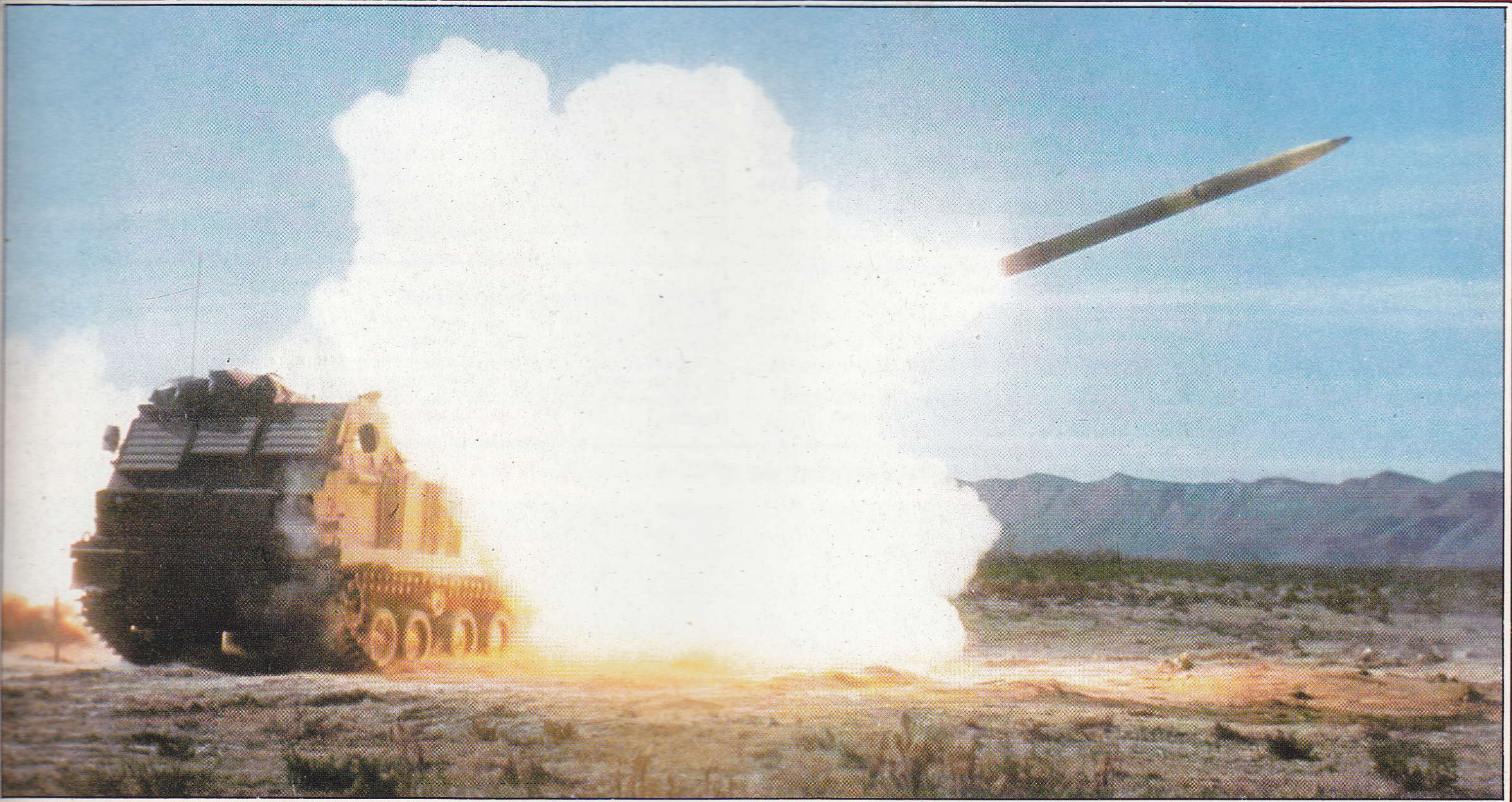

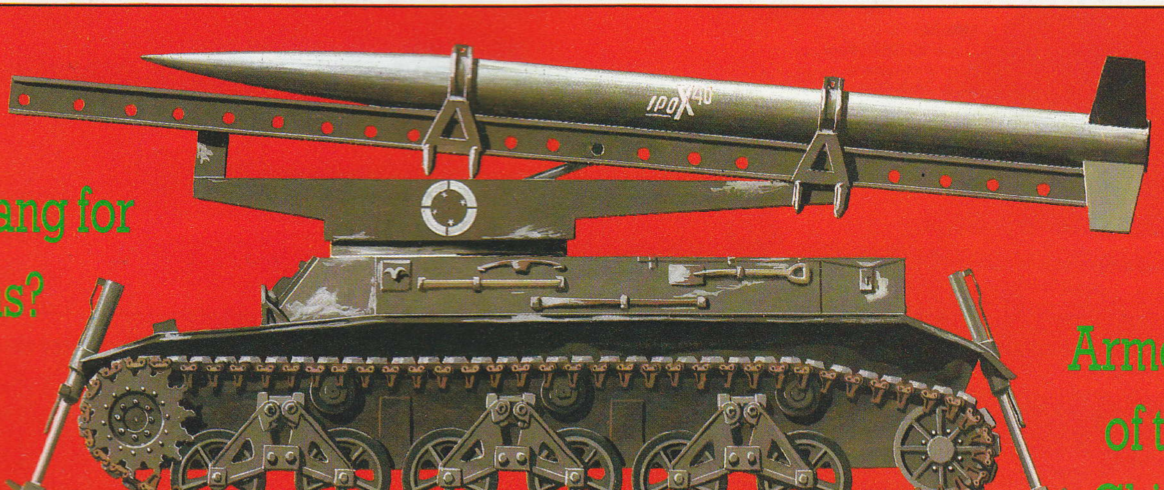

A Bigger Bang for the Russians?

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A fully illustrated guide to Modern Multiple Rocket-Launchers

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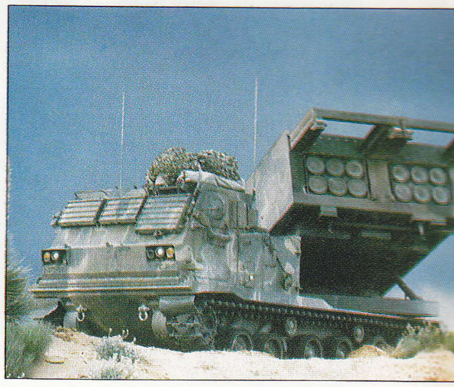
Modern Multiple Rocket Launchers



European members of NATO will shortly follow the US Army in purchasing the Vought Multiple Launch Rocket System. But, despite its ultra-modern appearance, the MLRS is no more effective than its truck-mounted Soviet equivalent, and is far more expensive.

The Soviet Union introduced the multiple rocket launcher (MRL) during World War II, and remains the world leader in their production and use. MRLs can produce a devastating concentration of fire; the shock effect alone has produced dramatic results in recent wars in Africa, and the MRL is also the ideal delivery system for smoke and chemical munitions.

Today the major exponent of the multiple rocket launcher (MRL) is still the USSR, which first introduced this weapon system onto the battlefield during World War II under the name 'Katyusha'. Basically an offensive weapon, the MRL is able to create tremendous concentrations of firepower in a short space of time, thus enhancing its surprise effect against any target engaged. The Soviets treat MRLs rather as a supplement to tube artillery because their rate of fire is low and the rockets they use are comparatively more expensive than shells. However, MRLs can put down heavy concentrations of smoke and chemical warfare agents, and it is this ability to deliver almost instantaneous high levels that puts them in a category above other systems, especially when blood agents such as hydrogen cyanide are concerned. During several of the wars in southern and central Africa it has been the shock effect of a salvo of rockets with all the attendant noise rather than the actual physical damage that has caused poorly trained troops to run away.

Surprisingly it is only recently that the West, and in particular the USA, has realized the importance of the MRL in modern warfare; but instead of learning direct from the Soviets their use of such weapons, most of the NATO nations which are due to deploy the joint American-European system known as the Multiple Launch Rocket System will, in fact, use it in place of conventional artillery pieces instead of as a supplement to them. Other countries happily have learnt the distinction and are bringing such systems into service with their armies. Perhaps the most noteworthy of these are Egypt, Israel, South Africa and Brazil, which are all now producing their own MRL designs. The last country has its newly designed ASTROS II system in service with the Iraqi army on the battlefields of the still seething Gulf War, while Israel has tested her designs against Syria during the 1982 'Peace for Galilee' invasion of Lebanon.

The launch signature of the Brazilian SS-60 is considerable; thus the firing platform will stay back from the forward line of troops in order to conceal itself by taking full advantage of the SS-60's 60-km (37.5-mile) range.

WEST GERMANY

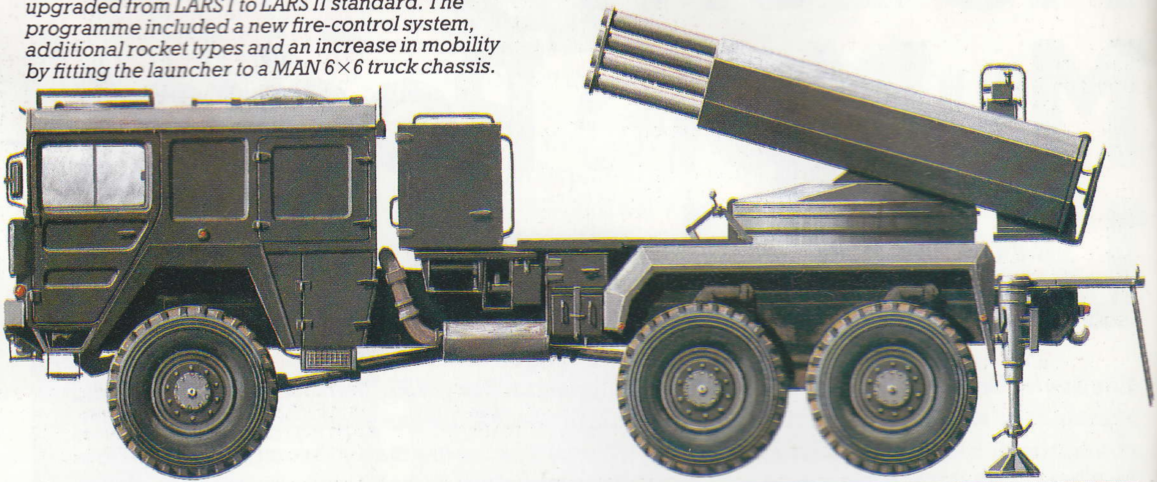
Light Artillery Rocket System (LARS)

The 110-mm (4.33-in) **Light Artillery Rocket System (LARS)** was developed in the mid-1960s and accepted into West German army service in 1969. It is issued on the scale of one battery of eight launchers per army division, each battery also having two 4×4 truck-mounted Fieldguard fire-control systems and a resupply vehicle with 144 rockets. Following upgrading to the **LARS II** standard, each launcher is now mounted on the rear of a 7000-kg (15,432-lb) MAN 6×6 truck chassis and consists of two side-by-side banks of 18 launcher tubes. The fin-stabilized solid propellant rockets can all be fired within 17.5 seconds, manual reloading taking approximately 15 minutes. The minimum and maximum ranges are 6 km (3.73 miles) and 14 km (8.7 miles) respectively. There are seven types of warhead that can be fitted to the rocket, these including the DM-711 mine dispenser with five parachute-retarded AT-2 anti-tank mines, the DM-21 HE-fragmentation, and the DM-701 mine dispenser with eight AT-1 anti-tank mines. A total of 209 LARS II launchers is in service with the West German army at present, and these are likely to be relegated to reserve units as the MLRS is phased into service during the late 1980s and early 1990s.

Specification

LARS II
Combat weight: 17480 kg (38,537 lb)
Crew: 3
Chassis: 7000 kg (15,432 lb) MAN 6×6 truck
Calibre: 110 mm (4.33 in)
No. of launcher tubes: 36
Rocket length: not known
Rocket weight: not known
Warhead types: HE-fragmentation, submunition, smoke, practice, radar target
Warhead weights: not known

The West German army's 110-mm (4.33-in) Light Artillery Rocket System has recently been upgraded from LARS I to LARS II standard. The programme included a new fire-control system, additional rocket types and an increase in mobility by fitting the launcher to a MAN 6×6 truck chassis.



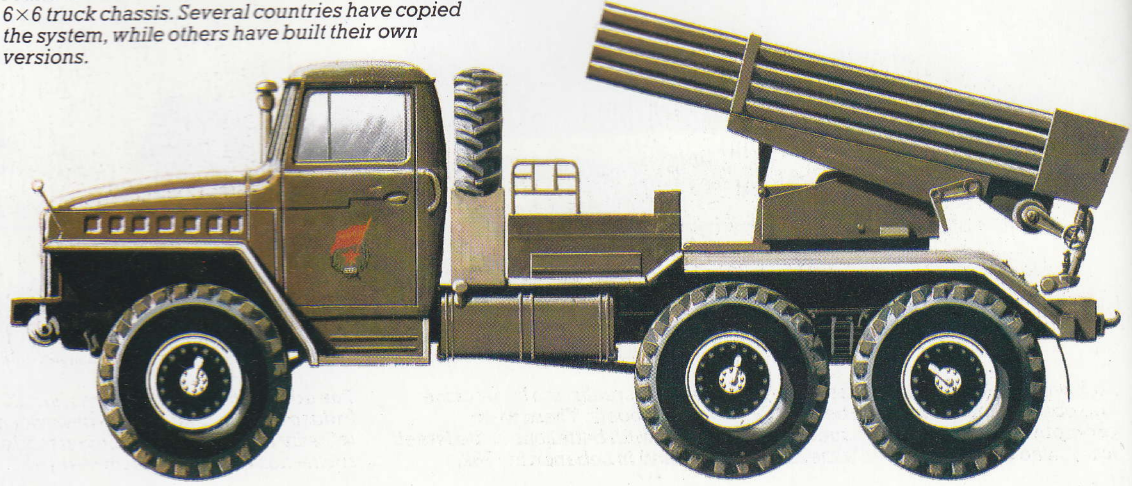
Called the Artillerie Raketenwerfer 110SF by the West German army, the system is issued on the scale of one battery per division, each battery having two Swiss Contraves Fieldguard radar fire control systems on a 4×4 truck chassis and a resupply vehicle with 144 rockets.

USSR

BM-21 multiple rocket-launcher

The 122-mm (4.8-in) **BM-21** MRL entered service in the early 1960s and has since become the standard MRL of the Warsaw Pact and most Soviet-supplied client states. Variants of the system have also been manufactured in China (the 40-round **Type 81** MRL), Egypt (a straight 40-round copy and modified 21- and 30-round systems, together with the **Sakr-18** and **Sakr-30** systems), India (the 40-round **LRAR** system) and Romania (a 21-round launcher on a Bucegi SR-114 lorry chassis). In the Warsaw Pact the BM-21 is found on both the Ural-375D 6×6 truck and, more recently, the ZIL-131 truck in a modified 36-round version identified as the **M1976** by NATO. There is also a 12-round launcher mounted on a small 4×4 vehicle, the **M1975**, which is in service with Soviet airborne troops as a replacement for the older towed 140-mm (5.5-in) MRLs. During the 1982 Israeli invasion of Lebanon the Israeli army came across a 30-round BM-21

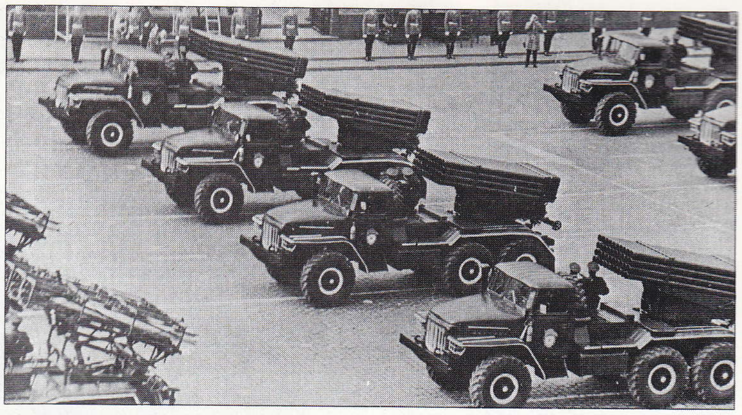
The standard Warsaw Pact Multiple Rocket Launcher is the 122-mm (4.8-in) BM-21, with a 40-round launcher mounted on the rear of a Ural-375 6×6 truck chassis. Several countries have copied the system, while others have built their own versions.



variant mounted on the rear platform of a Japanese Isuzu 6×6 truck which is identical in most respects to the Egyptian 30-round system mounted on the same chassis but is actually manufactured in North Korea under the designation **BM-11**.

The BM-21 is normally found in battalions of 18 integrated into the divisional artillery regiment, but a number of Category 1 motorized rifle divisions also have regimental batteries of six BM-21s or M1976s in service. The 122-mm rocket can be fitted with a smoke, HE-fragmentation, incendiary or chemical warhead, and the launcher can be filled with mixed loads if required. Most of the BM-21 variants have now been used in combat throughout the world, the latest Soviet systems having been blooded in Afghanistan against the guerrillas there. A number of local guerrilla forces such as the PLO have also taken parts of the BM-21 launcher to produce home-built systems for use in their internal conflicts. The PLO MRLs saw considerable use in the battles in and around Beirut from 1982 onwards.

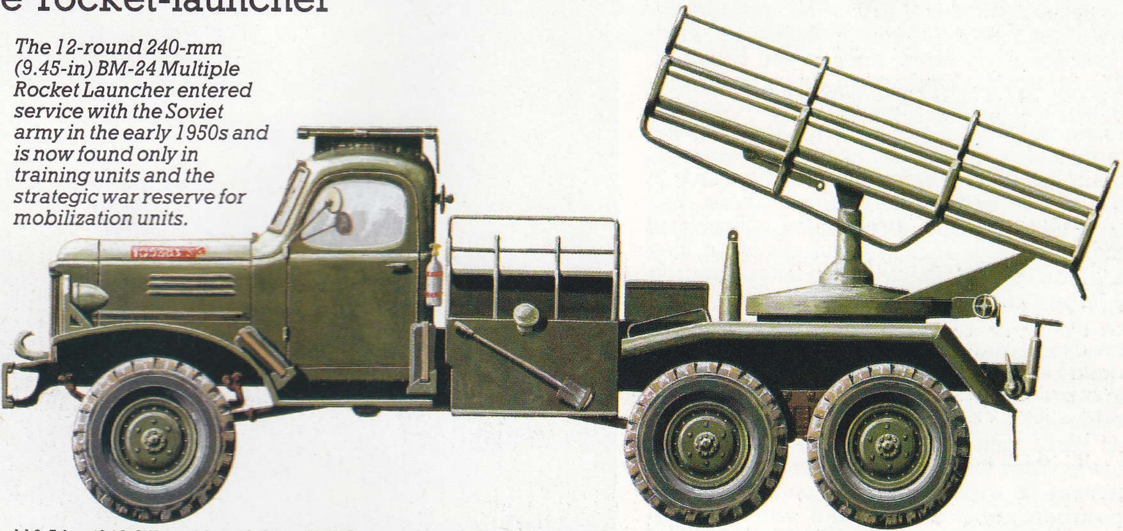
Specification
BM-21
Combat weight: 11500 kg (25,353 lb)
Crew: 6
Chassis: Ural-375D 6×6 truck
Calibre: 122 mm (4.8 in)
No. of launcher tubes: 40
Length of rocket: standard 3.23 m (10.6 ft), and short 1.91 m (6.3 ft)
Weight of rocket: standard 77 kg (169.75 lb), and short 45.8 kg (100.97 lb)
Warhead types: HE-fragmentation, incendiary, smoke, chemical
Warhead weight: 19.4 kg (42.77 lb)
Maximum range: standard 20.38 km (12.66 miles), and short 11 km (6.84 miles)



The BM-21 is seen in a Moscow parade with several 200-mm (7.87-in) four-round BMD-20 multiple rocket systems in front. In recent years the Soviets have also produced 36-round and 12-round MRLS, code-named M1976 and M1975 respectively by NATO, based on the BM-21 system.

USSR

BM-24 multiple rocket-launcher



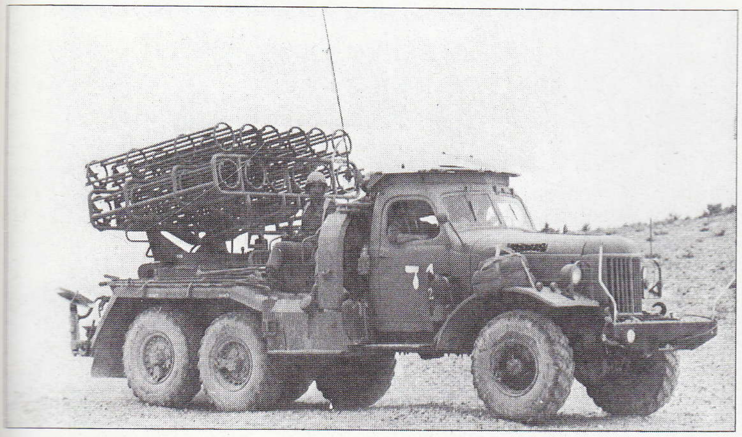
The 12-round 240-mm (9.45-in) BM-24 Multiple Rocket Launcher entered service with the Soviet army in the early 1950s and is now found only in training units and the strategic war reserve for mobilization units.

Introduced into service during the early 1950s, the 240-mm (9.45-in) **BM-24** MRL has now been replaced in front-line service by either the 122-mm (4.8-in) BM-21 or the 220-mm (8.66-in) BM-27 systems, and is now usually found in Soviet second-line units and the strategic reserve stockpile for issue during wartime to mobilized divisions. The BM-24 has been widely exported and has seen widespread use with the Arab armies in the Middle East against Israel.

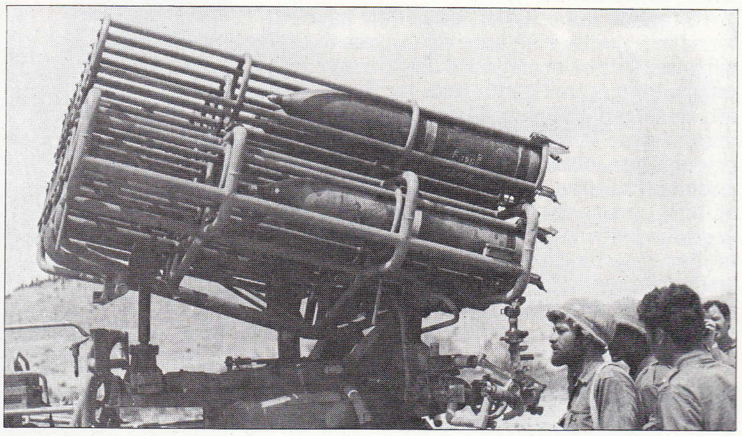
The system was originally mounted on the rear of the 2500-kg (5,512-lb) ZIL-151 6×6 truck, but is now to be found on the ZIL-157 truck chassis. The launcher consists of two rows of six tubular frame rails with two stabilizer jacks and armoured window shutters that need to be lowered for firing. Israel was so impressed by the system when it was used against its forces that it adopted captured BM-24s as one of the Israeli army's standard MRL systems. A new rocket was manufactured for the launcher, and the equipments were grouped into independent MRL artillery battalions which were used in combat during the 1973 'Yom Kippur' and 1982 'Peace for Galilee' wars. The new Israeli Military Industries rocket is 1.29 m (4.23 ft) long and weighs 110.5 kg (243.6 lb) with a 48.3 kg (106.5-lb) HE-fragmentation warhead of superior performance to that of the original Soviet type. The maximum range is slightly less than that of the Soviet rocket at 10.7 km (6.65 miles).

The Soviets also mounted a 12-round 240-mm launcher on the rear of an AT-S medium artillery tractor under the designation **BM-24T** for use by armoured units, but as far as it is known this is no longer in service, the tractors having been converted back to their original use.

Specification
BM-24
Combat weight: 9200 kg (20,283 lb)
Crew: 6
Chassis: 2500-kg (5,512-lb) ZIL-157 6×6 truck
Calibre: 240 mm (9.45 in)
No. of launcher rails: 12
Length of rocket: 1.18 m (3.87 ft)
Weight of rocket: 112..5 kg (248 lb)
Warhead types: HE-fragmentation, smoke, chemical
Warhead weight: 46.9 kg (103.4 lb)
Maximum range: 11 km (6.84 miles)



Following the 1967 war between the Arabs and the Israelis, the latter came into possession of large numbers of BM-24s as war booty. These were promptly refurbished and issued to independent MRL battalions of the Israeli army, who used them against the Arabs in 1973 and in Lebanon in 1982.



The adoption of the BM-24 into Israeli army service resulted in Israel Military Industries manufacturing a new rocket for the system that has greater lethality than the original Soviet model, although maximum range of the rocket has been marginally reduced.

The Gulf War

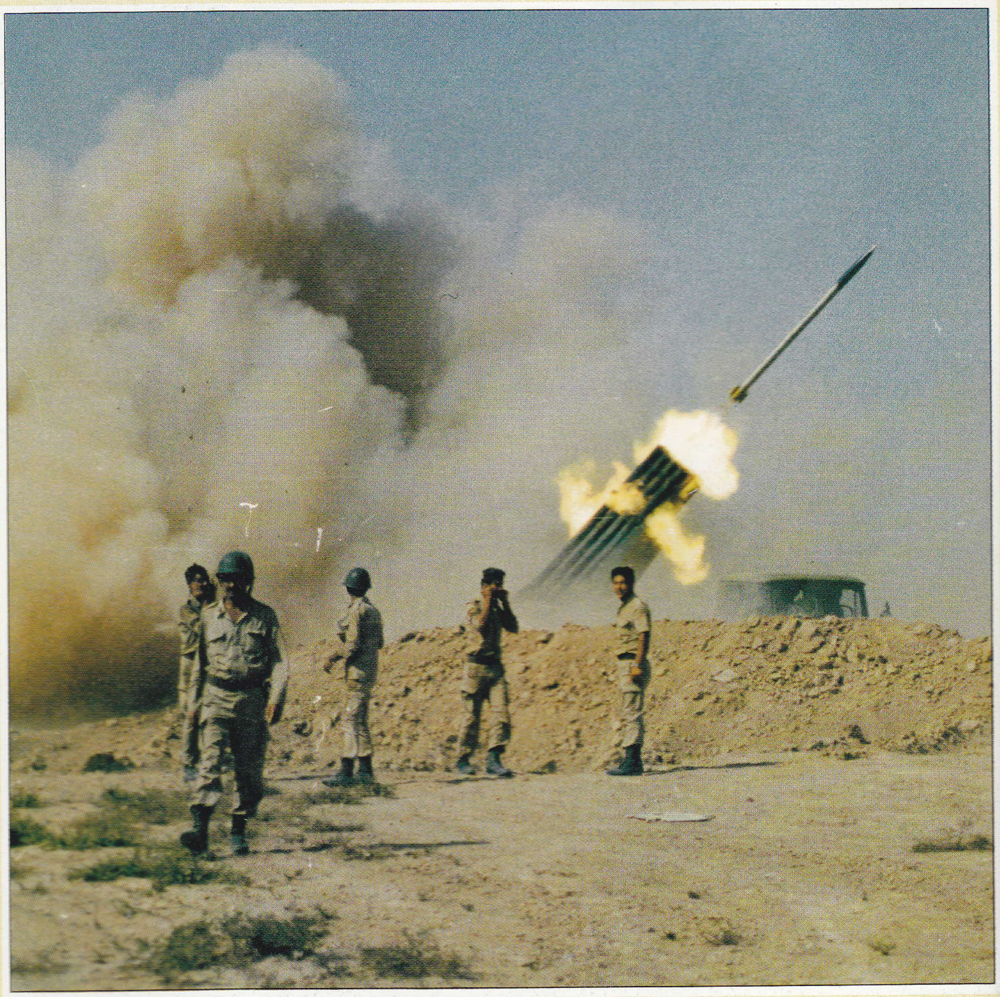
Five years ago Iraq took advantage of the chaos reigning in neighbouring Iran to launch an invasion, but the Iranians did not collapse as expected and the Iraqi advance ground to a halt. Since then a bloody war of attrition has continued, gaining attention in the West only when a tanker is attacked in the Gulf. In this conflict many of the world's latest weapons have been used, including Brazilian rocket-launchers and modern poison gases.

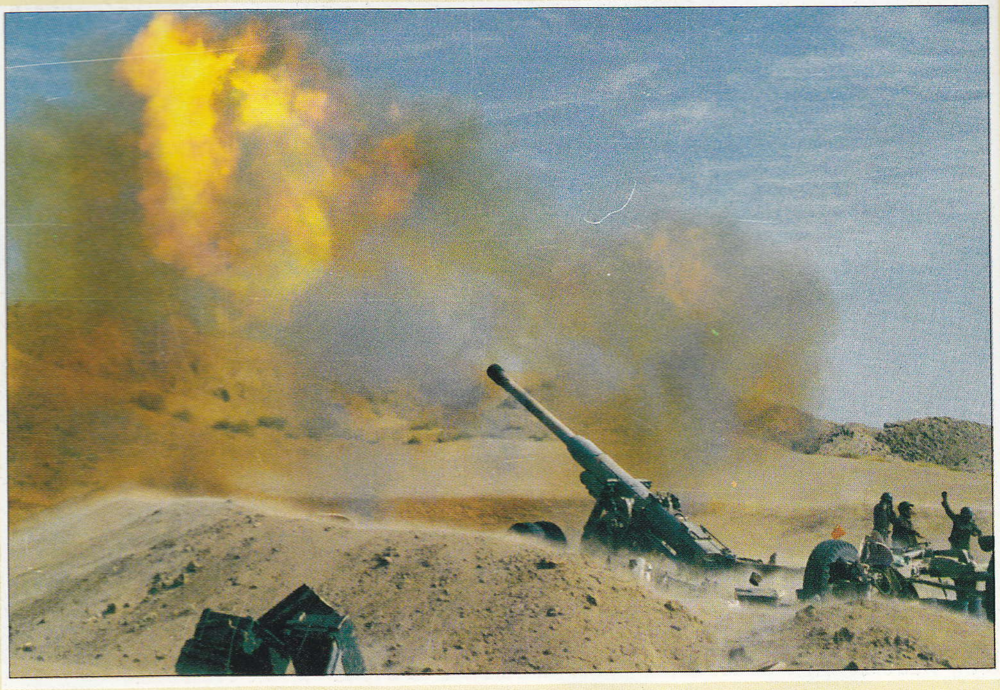
The Gulf War has by 1985 reached the stage where it seems that neither combatant is strong enough to win an outright victory. Nor, apparently, are they able to negotiate a peace agreement either directly or through a third party. The Iraqi armed forces are by far the better equipped, considerable financial resources having been channelled to them to buy the latest in weaponry in order to offset the Iranian advantage in ample reserves of willing manpower such as the Pasdaran (Revolutionary Guards), to launch almost suicidal ground offensives more reminiscent of World War I's Western Front than a battlefield of the 1980s. The 'Battle of the Marshes' around Hawizah in the south during early 1985 is conservatively estimated to have cost 20,000 Iranian and 10,000 Iraqi dead along with some four times these numbers in wounded, missing and captured. The equipment losses were almost as horrendous on both sides. Once this offensive and the threat to the Iraqi port of Basra and the main tarmac road to Baghdad had been beaten off, the Iraqis tried to shift attention northwards to the mountainous border region where they launched a limited diversionary offensive of their own. This soon petered out when they realized that the Iranians were not reacting on a large scale. Instead they resorted to air-to-ground aircraft and ground-to-ground missile attacks on Iranian industrial and civilian targets deep behind the front line. In what has become known as the 'Battle of the Cities', Iran promptly retaliated by bombarding border towns such as Basra with artillery, by attacking several towns deep within Iraq by aircraft, and by initiating its own long-range counter missile bombardment of Baghdad with Libyan-supplied but Soviet-built SS-1 'Scud-Bs' and what is believed to be an indigenously designed and built missile.

In the exchanges of long-range fire which became a substitute for concerted action on the battlefront, both sides supported their artillery with all available rocket launchers. A battery of MRLs in action is not only a fearfully lethal weapon but a splendid spectacle for home consumption.

To reduce the scale of losses they have suffered in a number of large offensives, the Iranians have now switched their strategy to limited-duration raids into Iraqi territory: these are designed to inflict heavy losses for minimum Iranian casualties. They also reduce the risk of large-scale personnel exposure to Iraqi chemical weapon counterattack. In the last two or three years the Iraqis are known to have used the following chemical warfare agents in artillery and mortar shells, aircraft bombs and aircraft spray tanks: the nerve gas Tabun, the blister agents Mustard gas and Lewisite (both separately and in a mixture), the toxic gas

Below: The use of the MRL providing defensive fire missions from prepared sites has resulted in Iraqi BM-21 batteries killing and wounding hundreds of Iranians with single salvoes during the latter's suicidal infantry attacks.





Although first used in combat by the Syrians and Egyptians against the Israelis in 1973, this is the first picture of the 180-mm (7.09-in) S-23 gun actually being fired in anger. It is being used by an Iraqi heavy artillery brigade with 84.09-kg (185-lb) F-43 HE rounds to bombard Iranian positions deep behind the front line.

Right: The Soviet-supplied BMP-1 MICV with its 73-mm smooth-bore low-pressure gun and AT-3 'Sagger' ATGWs has proved useful in countering Iranian infantry offensives due to its mobility and heavy firepower.

phosgene, and the blood gas hydrogen cyanide. It is believed that all these agents are actually being produced in Iraq at chemical plants supplied originally by Western firms for manufacturing agricultural chemicals. There are also reports of the Iraqis using the toxin weapon nicknamed 'Yellow Rain'. If this is correct then it is likely that the USSR has supplied stocks for combat testing in the various terrains and climates to be found along the border. The Soviet army uses MRLs to deliver intensive barrages of chemical munitions, a salvo of rockets being an ideal method to create a powerful concentration of toxic gas. It may not be long before the Iraqis supplement their existing improvised delivery systems with Soviet-supplied chemical rockets. Recently the Iranians have also alluded to having a small offensive chemical warfare capability, but as yet no reports have actually been received of it being used in combat.

Left: One of the lessons the Iraqis have learnt in combat with the Iranians is the value of using helicopters with combined arms units, as shown by this view of a Mil Mi-24 'Hind-D' gunship helicopter overflying an Iraqi mechanized unit on the offensive.

Apart from the land war, the Iraqis have also tried to bring pressure on Iran economically by attacking as much as possible of the civil merchant ship and tanker traffic heading to and from the ports and oil terminals in the northern end of the Persian Gulf. Using French-built AM.39 Exocet anti-ship missiles launched from Aérospatiale SA 321 Super Frelon helicopters and from Dassault-Breguet Super Etendard and Mirage F.1EQ5 jet fighters, the Iraqi air force has managed to hit and damage a fair number of ships but has not sunk many. One reason for this comparative failure lies in the fact that the Iranians are using barge-mounted decoys to screen ships on passage and at anchor. These missile attacks have been backed by an Iraqi navy mining campaign in Iranian coastal waters against the ports at the head of the Gulf. The mines used have been mainly Soviet-supplied AMD-500 and AMD-1000 magnetic influence ground mines together with a number of conventional MO8 moored contact mines. In order to force the minefields at some ports, the Iranians have formed convoys with limited minesweeper support ahead of them, but this has given the Iraqi navy the opportunity to launch missile attacks by small groups of 'Osa II' class fast attack craft fitted with SS-N-2 'Styx' missiles. Although scoring a number of successes, especially in the earlier war years, these attacks have also resulted in several losses of missile craft and supporting vessels.

Although the Iranian air force is now almost totally grounded because of lack of spares, a large number of attack and transport helicopters of the Iranian army are still flyable, prompting Iraqi tank crews to keep vigilant with their 12.7-mm (0.5-in) heavy machine-guns.

As a counter to the Iraqi successes at sea and as a direct warning to the Gulf States which are backing Iraq with money, the Iranian air force has taken to periodic attacks with its limited resources against merchant ships and tankers sailing close to the coasts of Qatar and Saudi Arabia, using unguided rockets and air-to-surface AGM-65A Maverick missiles. A number of ships have been badly damaged in the attacks, and on one early occasion Saudi Arabian air force McDonnell Douglas F-15 Eagles intercepted two Iranian Northrop F-5 Tiger IIs before they could attack a ship and shot down both with AIM-9L Sidewinders. No other interceptions have been tried since then, although US Air Force Boeing E-3A Sentry AWACS aircraft are continually watching the air space of the region in conjunction with the Saudi air-defence radar network.

The actual allies of the combatants in the war are illuminating to say the least. Iran is aided by Libya, Syria (the arch enemy of Iraq for many years before the war broke out) and North Korea. Recently a high-level Iranian political mission also visited the People's Republic of China in order to buy relatively cheap surface-to-air missiles and combat aircraft. Oddly enough, China is in fact already supplying Iran via North Korea, which has apparently delivered Type 62 light tanks, Type 63 towed multiple rocket-launchers and Shenyang F-6 'Farmer' and Shenyang F-7 'Fishbed' fighters, together with a number of locally-built but Soviet-designed T-62 MBTs. These armoured vehicles have joined an already extensive park of captured Soviet-built T-54, T-55, T-62 and T-72 MBTs which are being renovated, at Iran's sole tank rebuild facility at Masjed-Soleiman, for further use against their original owner.

South American allies

In complete contrast the allies on Iraq's side appear to be numbered in the tens. From Chile and Brazil in South America come arms supplies in the form of cluster bomb units and other air-to-surface munitions from the former, and armoured fighting vehicles from the latter. Brazil has also supplied the Iraqis with the FGT-108 MRL. This light, four-man rocket system can be mounted on a two-wheel trailer or a 4×4 vehicle, making it considerably more flexible than the truck-mounted weapons they have received from the USSR. From France in Western Europe comes the AM.39 Exocet plus significant numbers of armoured vehicles, anti-tank and surface-to-air missiles, together with a major part of the helicopter fleet and the Mirage F.1 and Super Etendard jet fighters. Major shipments of arms, aircraft and ammunition, including the FROG-7 and 'Scud-B' surface-to-surface missiles used in bombarding civilian population centres, are still maintained from the USSR at regular intervals. The Soviets supplied the bulk of Iraq's artillery park, for example D-30 122-mm and M-46 130-mm guns and have recently delivered a number of monstrous S-23 180-mm weapons. The Iraqis use both BM 21 and BM 14 MRLs mounted on Ural-375 and ZIL-131 trucks respectively. The money to pay for a lot of weapons comes from Saudi Arabia and the other Gulf States in the form of grants. Another major arms supplier of both armoured vehicles and combat aircraft is, surprisingly, the People's Republic of China: large shipments of Type 59 and Type 69 MBTs have been seen entering Iraq, together with Type YW531 APCs plus F-6 and F-7 jet fighters. The aircraft are first assembled at an Egyptian air base near Cairo from knock-down kits supplied by China and then flown to eastern Jordan to a military airfield which is effectively a rear-base for the Iraqi air force and which is out of range of any Iranian air strike. Egypt is also providing a large part of its extensive arms industry output to Iraq while, together with Jordan, supplying volunteers to fight alongside the Iraqi army as well as military advisers at high level to aid in strategic planning. Finally the Iraqis themselves have set up their own small arms industry to produce weapons for the large number of men it has under arms.

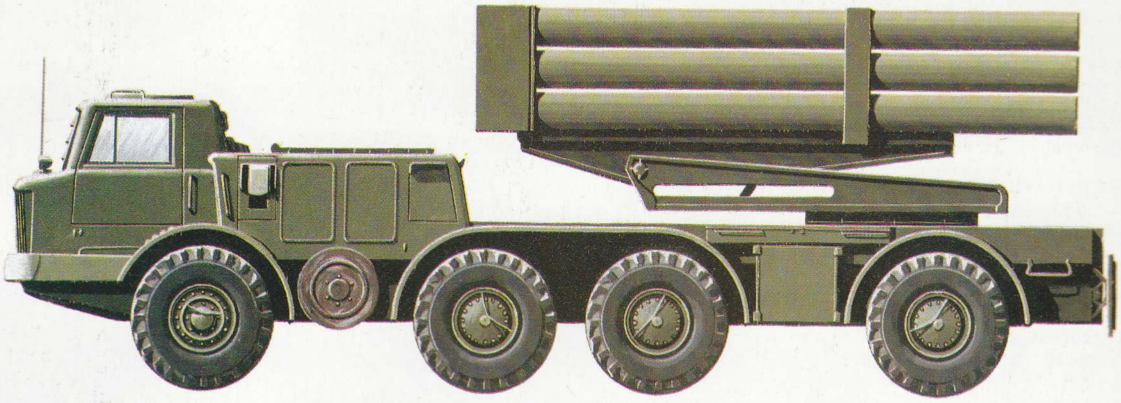
Where the conflict is likely to lead over the next few years is anybody's guess, though what is most likely, however, is an escalation whereby Iranian aircraft and/or ground forces will strike at targets along the Gulf in countries supporting Iraq in an effort to scare them off. There may also be a point at which certain Western countries may have to combine to launch a pre-emptive strike against Iranian targets to protect their own civil merchant traffic in the Gulf or to punish Iran for its support of international terrorism. The navies of France, the UK and the USA already have units in the vicinity for protection purposes, while US carrier battle groups can easily be brought into strike range of Iranian shore targets to carry out the latter if required. However, any action of either kind would bring its own set of problems into a region already in turmoil. For Iran the only action which could conceivably bring a peace of sorts would be the downfall of the Iraqi president Saddam Hussein and his Baathist government. Unfortunately or fortunately, depending upon which side one supports, the only way this might be done is by destroying the Iraqi army, and as the Iraqi armed forces are stronger in all areas save manpower than those of the Iranians, the only way forward for the foreseeable future would appear to be a continuation of the current conflict.

When Iranian artillery shell Iraqi forward positions, a counter-battery reply is initiated by radar-guided 130-mm (5.12-in) M-46 field guns. The guns are also used to soften up Iranian rear positions during the limited offensives now undertaken by the Iraqi army.

USSR

BM-27 multiple rocket-launcher

The 16-round 220-mm (8.66-in) **BM-27** MRL entered the active inventory of the Soviet army in the mid-1970s and is found in selected Category 1 motorized rifle and tank division artillery regiment rocket-launcher battalions, and at battalion strength in the combined arms army artillery brigades. In the tank army the artillery brigade has been replaced by an MRL regiment of three battalions with 72 BM-27s, while at front level the system has been integrated into the rocket-launcher brigade of the artillery division. The BM-27 is designed to provide chemical, HE and submunition (including anti-personnel, incendiary and minelet) supporting fire to first-echelon manoeuvre units during offensive and defensive operations. The launcher comprises one layer of four tubes on two layers of six tubes, and is carried on the rear platform of a ZIL-135 8×8 truck chassis. A rapid-reload system allows a second ZIL-135 carrying 16 reload rounds to transfer its load within five minutes. For firing four stabilizer jacks have to be lowered, two at the rear and one on each side of the vehicle. It is believed that the system has also been exported in limited numbers to Syria for combat evaluation against Israel.

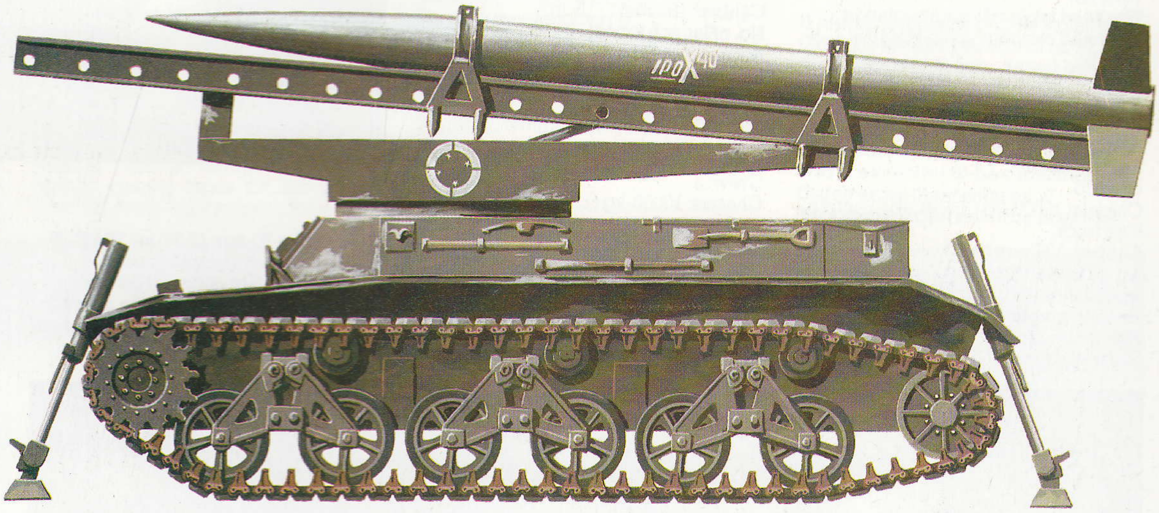


Specification
BM-27
Combat weight: 22750 kg (50,155 lb)
Crew: 6
Chassis: ZIL-135 8×8 truck
Calibre: 220 mm (8.66 in)
No. of launcher tubes: 16
Length of rocket: 4.8 m (15.75 ft)
Weight of rocket: 360 kg (793.7 lb)
Warhead types: HE-fragmentation, chemical, submunition
Warhead weights: not known
Maximum range: 40 km (24.85 miles)

The most recent Soviet rocket-launcher system to enter service is the 220-mm (8.66-in) 16-round BM-27 mounted on the rear of the ZIL-135 8×8 truck chassis. In operational characteristics it is very similar to the American MLRS.

BRAZIL

Brazilian multiple rocket-launcher systems



The X-40 is the largest of the Brazilian rockets, and is fired from the XLF-40 version of the X1A1/X1A2 series light tank. Although at one time thought to be an operational system, it is now known to be used in armament research trials.

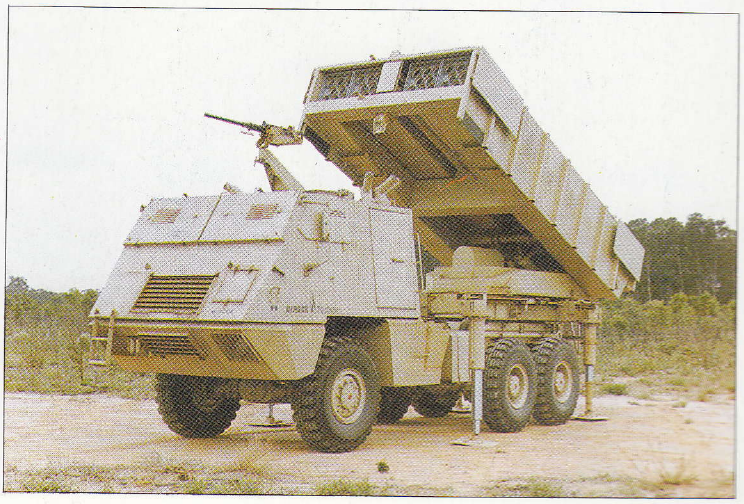
Since the early 1960s the Brazilians have been developing MRL systems both for the home and export markets. The first was the **FGT-108RA1** which is currently used by the Brazilian army, Brazilian marines and Iraq. It utilizes a single-stage solid-propellant 108-mm (4.25-in) calibre rocket fired from a 16-round launcher which is mounted either on the back of a light 4×4 vehicle or, more normally, on a two-wheeled trailer. The crew consists of four and a battery of these weapons has four launchers.

The X2A1 trailer used for the FGT-108 was also the basis for the next system, the 36-round **SBAT-70** launcher. This fires a modified version of the standard 70-mm (2.76-in) Avibras folding-fin aircraft rocket which can be fitted with one of seven different types of warhead. Although not operational with the Brazilian army the SBAT-70 has been produced for several unidentified export customers.

Avibras also adapted its 127-mm (5-in) calibre air-to-surface rocket in the same way to produce the **SBAT-127** system for export. This utilizes a 12-rail launcher for either trailer or vehicle mounting, but has the choice of only two different-weight HE-fragmentation warheads. The maximum range is achieved at a launcher elevation of 47°.

These systems were followed by two experimental research rockets, the **FGT X-20** and **FGT X-40** to improve long-range rocket technology. These were followed in the early 1980s by a request to Avibras from a foreign country, believed to be Iraq, to design a mobile MRL system. With the aid of Brazilian army inputs this resulted in the **Astros II** modular mobile MRL system mounted on identical 10000-kg (22,046-lb) Tectran 6×6 truck chassis. The three variants are the 32-round **SS-30**, the 16-round **SS-40** and the four-round **SS-60**, which differ only in the size and weight of the rockets they fire.

A typical battery is believed to comprise from four to eight launchers with optional radar fire-control vehicles. The crew consists of three men, with reloading undertaken from other trucks using module rocket pods. Iraq ordered 60 batteries of the Astros II and is already using the system in combat against Iran. Libya is also believed to have ordered a few batteries, while the Brazilian army is known to be interested.



This is the Tectran 6×6 truck chassis launcher for the SS-30 rocket. The modular design can be clearly seen, with the four eight-round launch tube containers located within the firing platform on the truck's rear deck.

Brazilian multiple rocket-launcher systems (continued)

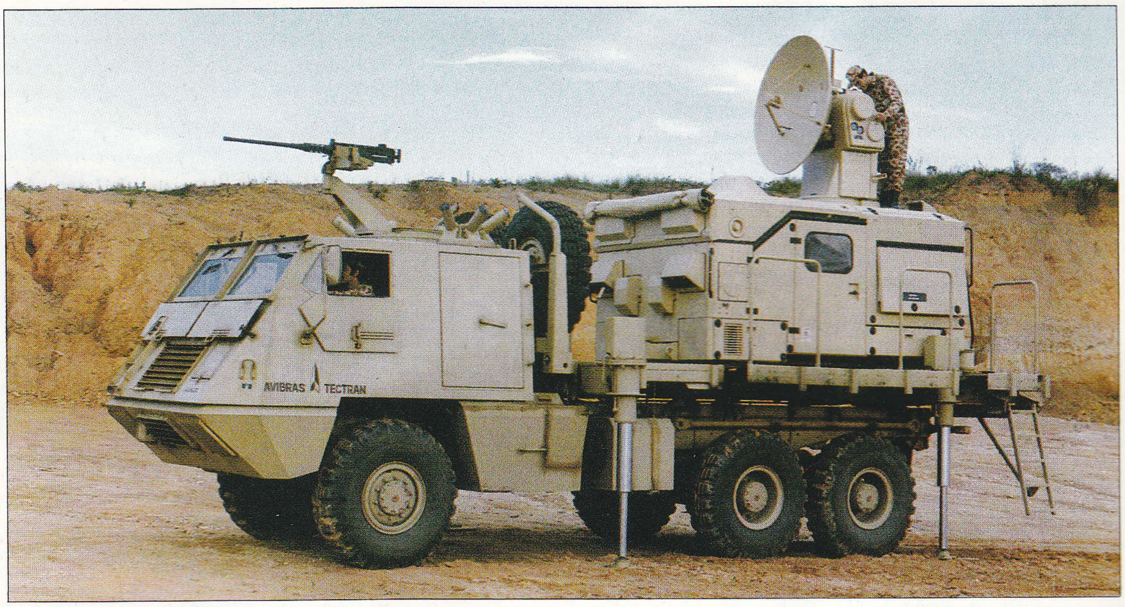
Specifications

FGT-108
Combat weight: 802 kg (1,768 lb)
Crew: 4
Chassis: X2A1 trailer
Calibre: 108 mm (4.25 in)
No. of rocket tubes: 16
Rocket length: 0.97 m (3.18 ft)
Rocket weight: 17 kg (37.5 lb)
Warhead type: HE-fragmentation
Warhead weight: 3 kg (6.6 lb)
Maximum range: 7 km (4.35 miles)

SBAT-70
Combat weight: 1000 kg (2,205 lb)
Crew: 4
Chassis: X2A1 trailer
Calibre: 70 mm (2.76 in)
No. of rocket tubes: 36
Rocket length: not known
Rocket weight: 9 kg (19.84 lb)
Warhead types: HEAT, HE-fragmentation, HE-anti-tank/anti-personnel, anti-personnel flechette, smoke, practice
Warhead weight: 4 kg (8.8 lb)
Maximum range: 7.5 km (4.66 miles)

SBAT-127
Combat weight: not known
Crew: 4
Chassis: trailer or vehicle
Calibre: 127 mm (5 in)
No. of launcher rails: 12
Rocket length: not known
Rocket weights: 48/61 kg (105.8 lb/134.5 lb)
Warhead type: HE-fragmentation
Warhead weights: 22/35 kg (48.5/77.2 lb)
Maximum ranges: 14 km/12.5 km (8.7/7.77 miles)

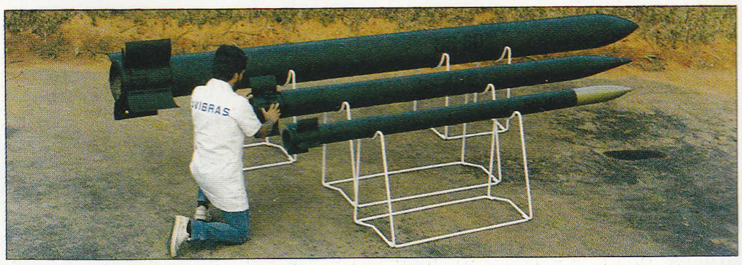
Astros II
Rocket: SS-30
Crew: 3
Chassis: 10000-kg (22,046-lb) Tectran 6×6 truck
Calibre: 127 mm (5 in)
No. of launch tubes: 32
Rocket length: 3.9 m (12.8 ft)
Rocket weight: 68 kg (149.9 lb)
Maximum range: 30 km (18.64 miles)
Warhead types: HE



The fire control system for the Astros II modular multiple rocket system can be the Swiss Contraves Fieldguard J-band radar, with a 300-m (984.25-ft) to 20000-m (65616.8-ft) range. It is used to plot rocket trajectories and hence calculate the impact point.

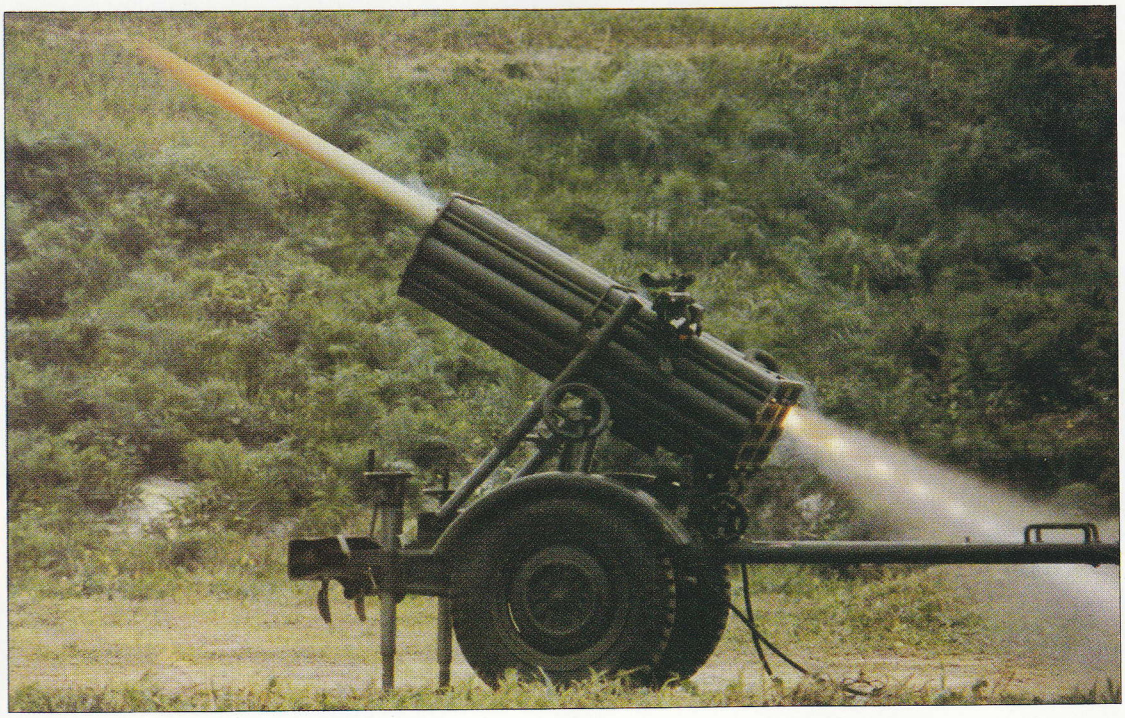
Rocket: SS-40
Crew: 3
Chassis: 10000-kg (22,046-lb) Tectran 6×6 truck
Calibre: 180 mm (7.09 in)
No. of launch tubes: 16
Rocket length: 4.2 m (13.78 ft)
Rocket weight: 152 kg (335.1 lb)
Maximum range: 35 km (21.75 miles)
Warhead types: HE, submunition

Rocket: SS-60
Crew: 3
Chassis: 10000-kg (22,046-lb) Tectran 6×6 truck
Calibre: 300 mm (11.81 in)
No. of launch tubes: 4
Rocket length: 5.6 m (18.37 ft)
Rocket weight: 595 kg (1,311.7 lb)
Maximum range: 60 km (37.28 miles)
Warhead types: HE, submunition



Above: The relative sizes of the 127-mm (5-in) SS-30, the 180-mm (7.09-in) SS-40 and 300-mm (11.81-in) SS-60 artillery rockets can be seen here. The two larger rockets have cluster munition warheads with dual effect anti-armour anti-personnel bomblets.

Below: The 70-mm (2.76-in) SBAT-70 36-tube trailer-mounted rocket-launcher system is based on the standard Avibras folding-fin aircraft rocket, and is currently being offered on the export market.



Above: Smallest of the Astros II artillery rockets fired from the Tectran 6×6 truck launcher is the 127-mm (5-in) calibre SS-30, which has a range of 30 km (18.75 miles). A total of 32 launch tubes are fitted to this configuration of the launcher.

USA

Multiple Launch Rocket System (MLRS)

Initiated as a feasibility study in 1976, the concept definition phase of the **General Support Rocket System (GSRS)** was contracted to five different firms. After evaluation of these, Boeing Aerospace and Vought Corporation (now LTV Aerospace and Defence Company) were asked to compete in the follow-on validation stage. At the same time the system was directed towards a standard NATO weapon design. The trials were held in 1979 and early 1980, with the result that Vought was chosen as the winner. In the same year the GSRS title was changed to the definitive **Multiple Launch Rocket System (MLRS)**.

The first production battery of Self-Propelled Launcher Loaders (SPLL), based on the M2 IFV chassis, was delivered to the US Army in 1982, with the final inventory total due to be 333 by the early 1990s. The European nations that have decided to procure the MLRS are the UK (67 SPLLs), West Germany (202 SPLLs), France (56 SPLLs), and Italy (20 SPLLs), with the Netherlands indicating a requirement for 30 SPLLs for procurement when funding permits. Most of the European systems will be built in Europe by a consortium of companies.

Each SPLL carries 12 rockets in two six-round pods, and can be self-loaded from a resupply vehicle within 10 minutes. Four warheads have or are in the process of being developed for the single-stage solid-propellant rocket. These are the basic Phase I submunition model with a range of about 30 km (18.6 miles) carrying 644 M77 dual-purpose shaped-charge blast-fragmentation bomblets each weighing 0.23 kg (0.51 lb) and capable of piercing some 100 mm (3.94 in) of armour plate; the Phase II mine-dispenser model, with 28 AT-2 parachute-retarded anti-tank mines developed by West Germany, allowing a rocket range of 40 km (24.9 miles); the Phase III submunition model with six individual active-radar terminally-guided shaped-charge free-fall weapons allowing a rocket range of 42 km (26.1 miles); and a US only chemical warhead containing approximately 41.7 kg (92 lb) of binary nerve gas chemical agents.

Further studies are being carried out to see if lightweight three- or six-round rocket pods based on the MLRS design can be mounted on more mobile chassis types for use by the new US Army lightweight divisions.

Specification

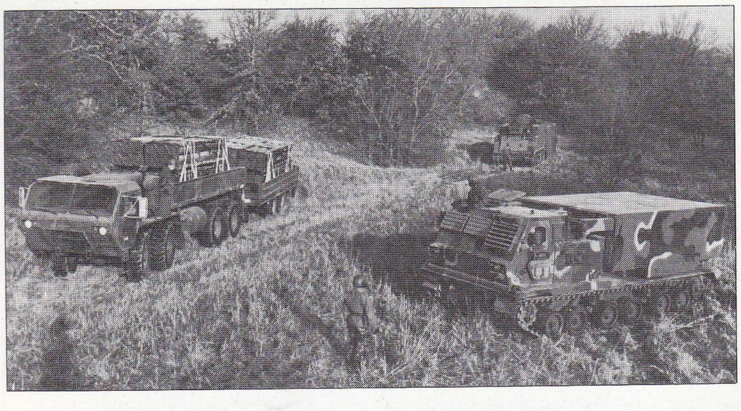
MLRS

Combat weight: 25191 kg (55,536 lb)
Crew: 3
Chassis: M2 IFV
Calibre: 227 mm (8.94 in)
No. of launcher tubes: 12
Rocket length: 3.94 m (12.93 ft)
Rocket weight: 308 kg (679 lb)
Warhead types: submunition, chemical
Warhead weights: not known
Maximum ranges: see text

Designed for all-terrain mobility, the Self-Propelled Launcher-Loader (SPLL) is fitted with two pods of six 227-mm (8.94-in) calibre rockets, which can be rapidly replaced.

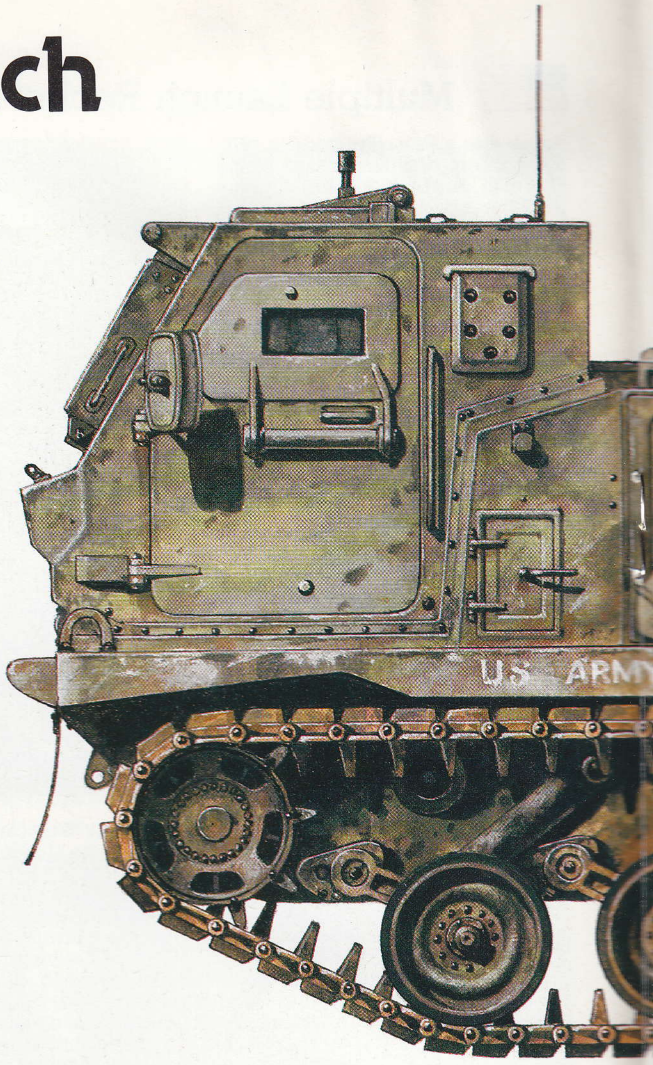
A Multiple Launch Rocket System (MLRS) vehicle fires one of its 227-mm (8.94-in) rockets. Based on the M2 Infantry Fighting Vehicle chassis, the MLRS has already been ordered by the American, French, Italian, West German and British armies, and is expected to be chosen by the Dutch army to replace or supplement current tube artillery.

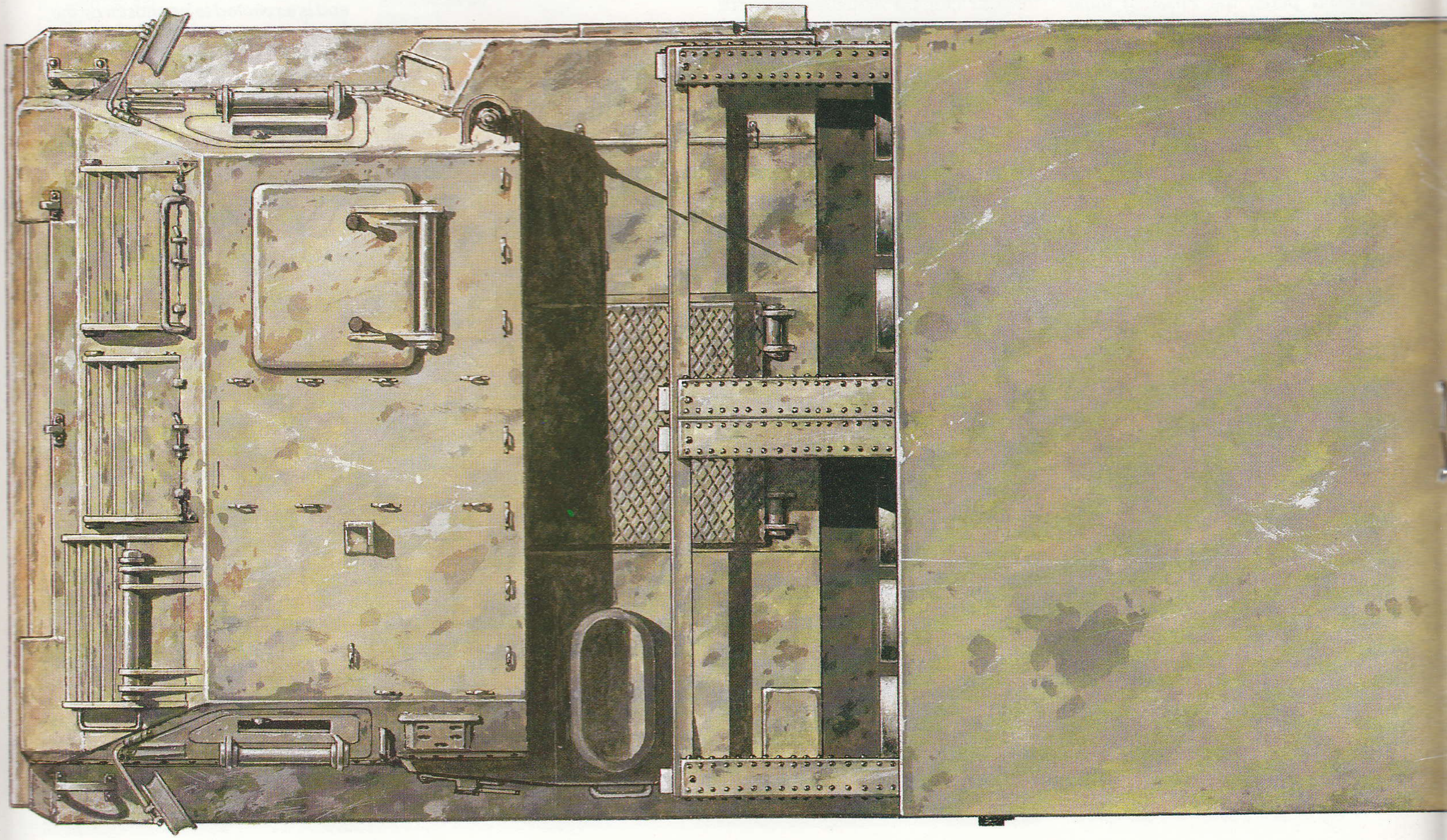
Vought Multiple Launch Rocket System

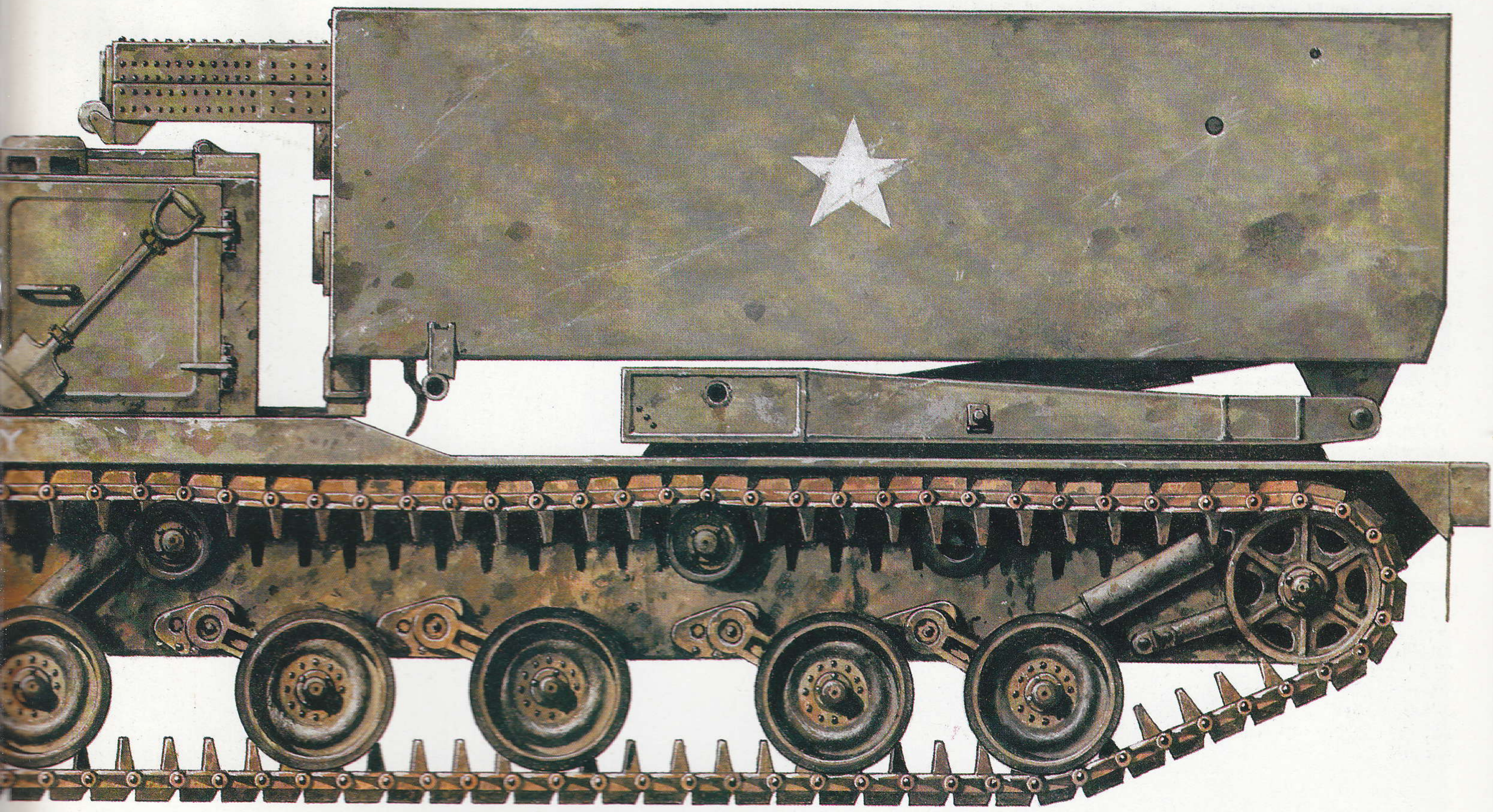


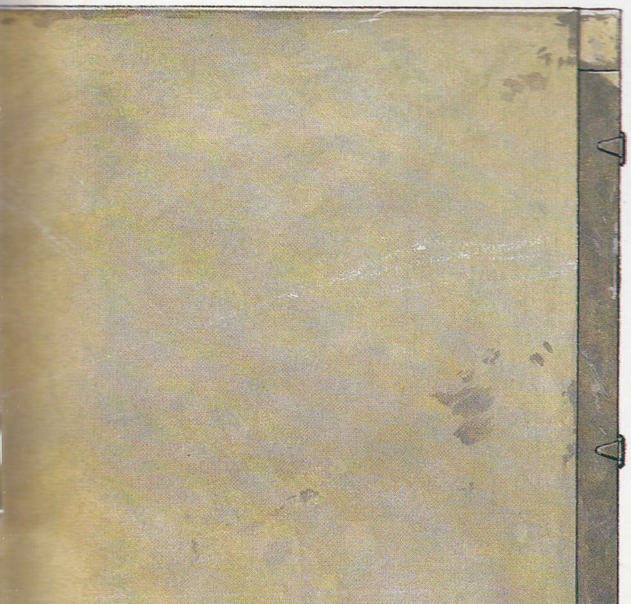
Above: A typical MLRS battery will contain an M577 Armoured Command Post and a number of Oshkosh Heavy Expanded Mobility Tactical Trucks (HEMTT) with Heavy Expanded Mobility Ammunition Trailers (HEMAT) that each carry four reload six-round rocket pods for the launchers.

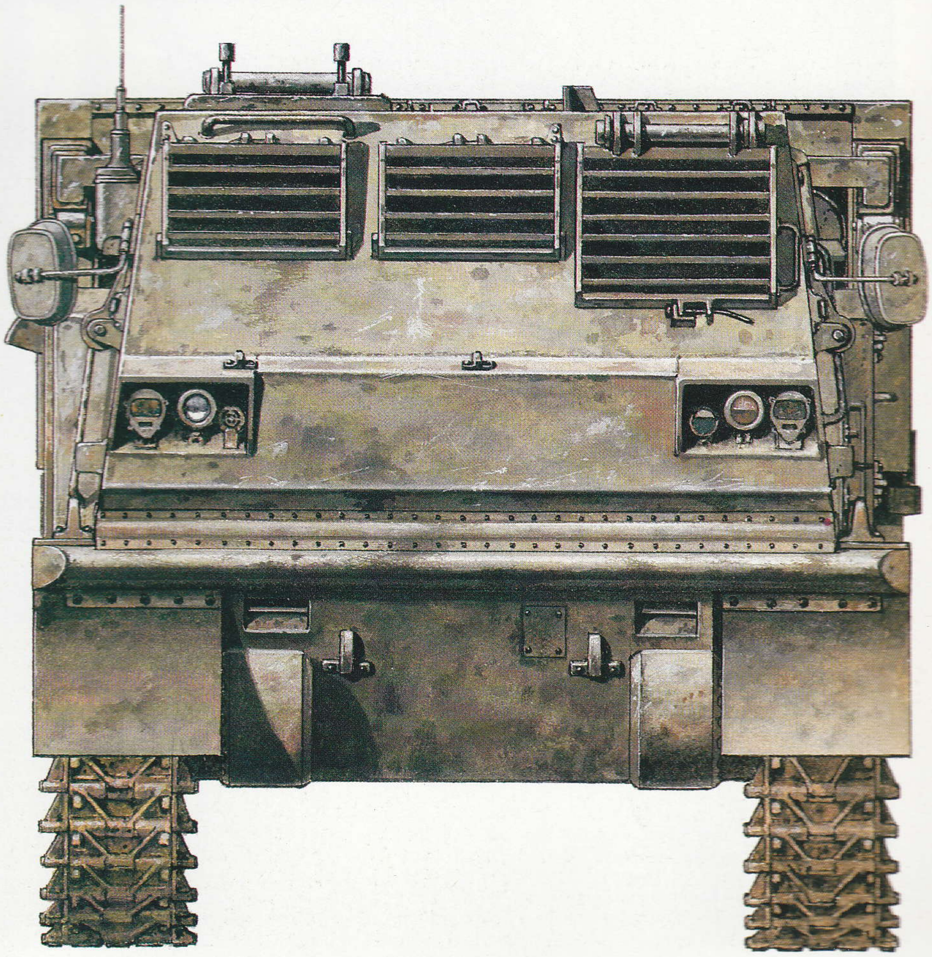
Right and below: Air transportable in C-130, C-141 and C-5 transport aircraft, together with its support vehicles, the MLRS is currently being issued to the new-style 'heavy' armoured and mechanized divisions of the US Army under the 'Division '86' plan on the scale of one battery each with three firing platoons of three MLRS, and two batteries each with six M110 203-mm (8-in) self-propelled howitzers in a single mixed artillery battalion. A total of 333 Self-Propelled Launcher-Loaders (SPLLs) with 362,832 tactical and 27,648 training rockets, together with 480 resupply vehicles, are due to be procured by 1990.











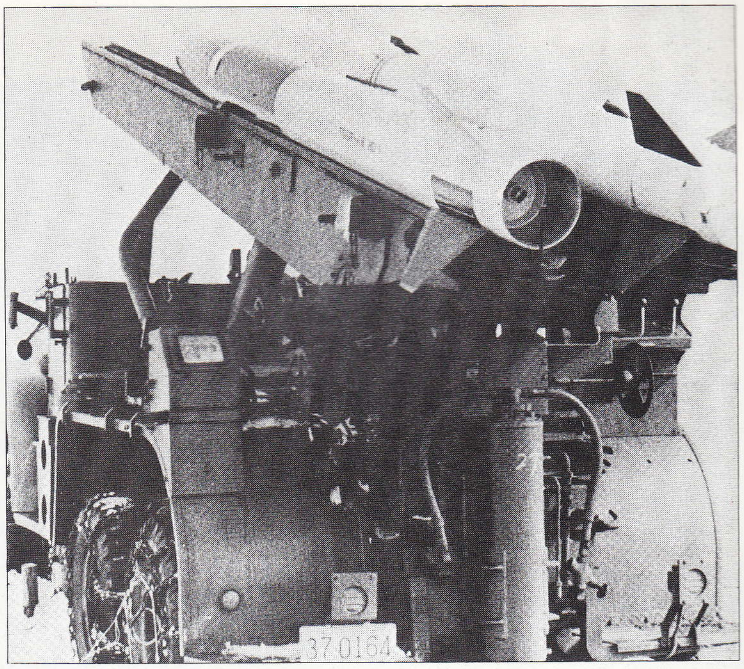
JAPAN

Type 67 multiple rocket-launcher

Developed in 1965 by a division of the Nissan Motor Company Ltd, the 307-mm (12.09-in) **Type 67** MRL entered service with the Japanese Ground Self-Defence Force in 1968. The system consists of a 4000-kg (8,818-lb) Hino 6×6 truck chassis fitted with two launch rails for the Type 68 rocket. Another Hino 6×6 truck acts as the resupply vehicle and carries six reload rounds, which are transferred to the launcher by a hydraulic crane. Before firing three truck stabilizers have to be lowered to the ground, one on each side of the vehicle and one at the rear. The Type 67 is used by artillery units and some 50 in-service systems complement the similar number of 15-km (9.3-mile) 130-mm (5.12-in) 30-round **Type 75** MRLs mounted on a derivative of the Type 73 tracked APC which are used by the mechanized and armoured brigades. More modern systems to eventually replace the Type 67 and Type 75 are already under investigation, with the former likely to be mounted on a tracked chassis to improve mobility over rough terrain.

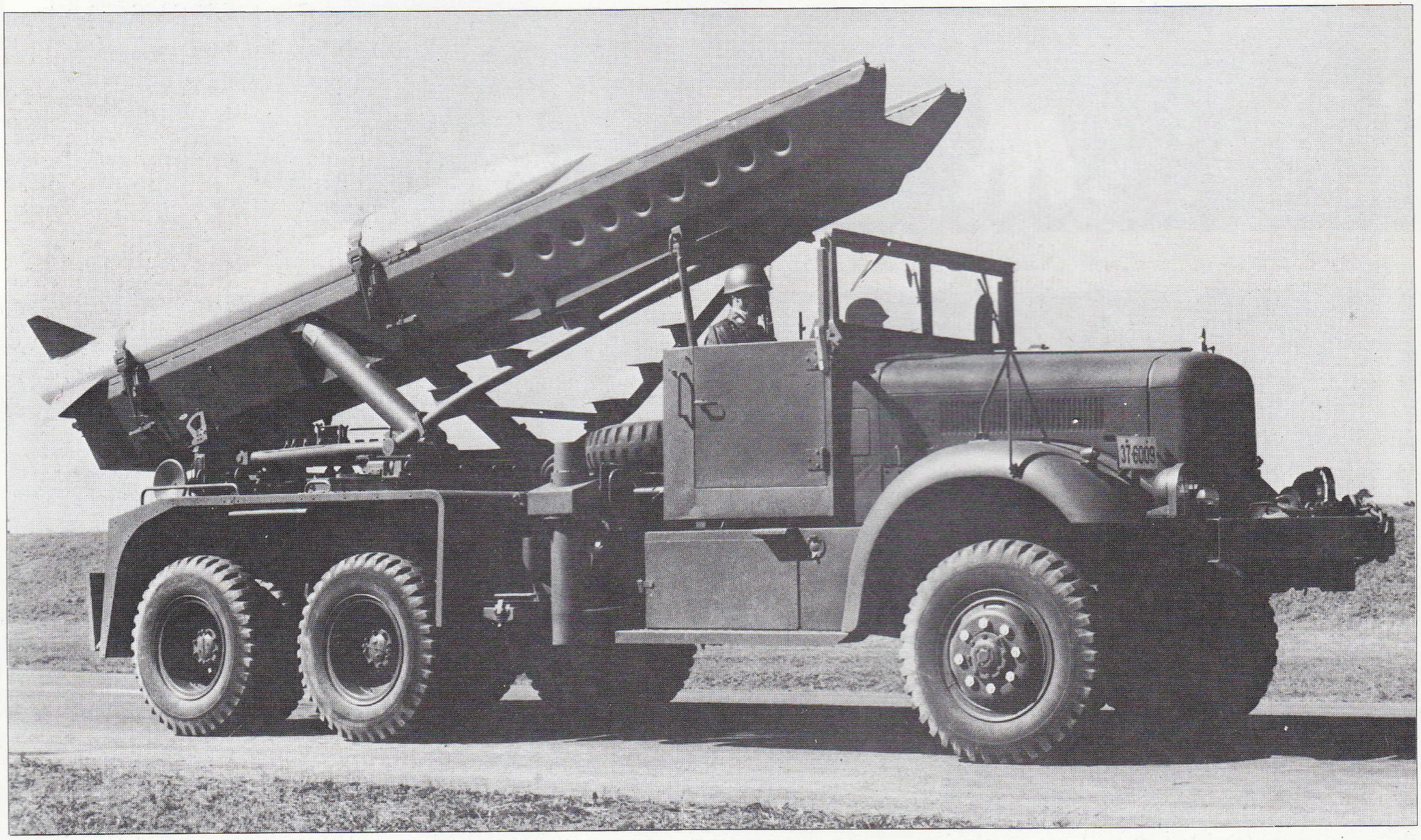
Specification

Type 67 MRL
Combat weight: not known
Crew: 4-6
Chassis: 4000 kg (8,818-lb) Hino 6×6 truck
Calibre: 307 mm (12.09 in)
No. of launch rails: 2
Rocket length: 4.5 m (14.76 ft)
Rocket weight: 573 kg (1,263.2 lb)
Warhead type: HE-fragmentation
Warhead weight: not known
Maximum range: 28 km (17.4 miles)



Right: The two Type 68 307-mm (12.09-in) solid fuel rockets are seen on the launch rails of a Hino 6×6 truck-mounted Type 67 launcher of the Japanese Ground Self-Defence Force. The rocket has a range of 28 km (17.5 miles) and is fitted with an HE warhead.

A Type 67 rocket launcher is seen in travelling order with two Type 68 rockets in position on the launch rails. Another Hino 6×6 truck fitted with a hydraulic crane and carrying six reload rounds is used to resupply the vehicle.



CZECHOSLOVAKIA

RM-70 multiple rocket-launcher

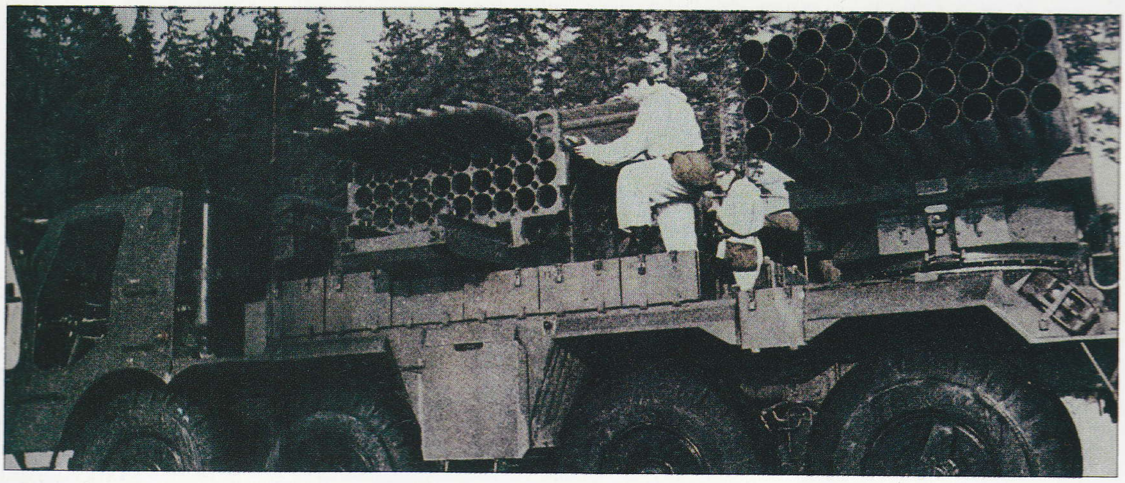
First seen during 1972, the 122-mm (4.8-in) calibre **RM-70** MRL is an armoured version of the Czech Tatra 813 8×8 truck with the Soviet 40-round BM-21 launcher and a reload pack of 40 rounds mounted to the rear of the cab for rapid reloading. The vehicle is fitted with a central tyre pressure-regulation system (to allow adjustment to suite the type of terrain being crossed) and, if required, a BZT dozer blade for preparing its own fire positions and clearing obstacles. The scale of issue of the RM-70 is one battalion of 18 launchers in three batteries per Czech army tank and motorized rifle division. The RM-70 is also known to be in service with the East German and Libyan armies and, it is believed, with selected Category 1 divisions of the Soviet army.

Two types of fin-stabilized rocket are fired, a short round with a range of 11 km (6.84 miles) and the standard long round with a range of 20.38 km (12.66 miles). It is also possible to fire the short round with an additional motor to increase the range to 17 km (10.56 miles). However, this version together with the short one are more likely to be encountered in the single-tube launcher used by guerrilla forces throughout the world.

Specification

RM-70
Combat weight: 33700 kg (74,296 lb)
Crew: 6
Chassis: 7900-kg (17,417-lb) Tatra 813 8×8 truck

Calibre: 122 mm (4.8-in)
No. of launcher tubes: 40
Rocket lengths: standard 3.23 m (10.6 ft), and short 1.91 m (6.27 ft)
Rocket weights: standard 77 kg (169.75 lb), and short 45.8 kg (100.97 lb)
Warhead types: HE-fragmentation, incendiary, smoke, chemical
Warhead weight: 19.4 kg (42.77 lb)
Maximum ranges: standard 20.38 km (12.66 miles), and short 11 km (6.84 miles)



The Czechoslovakian army has adopted its own version of the standard Soviet 122-mm (4.8-in) multiple rocket launcher system known as the RM-70, the major difference being that the new version has a complete 40-round reload pack of rockets to speed up reloading.

YUGOSLAVIA

Yugoslav multiple rocket-launchers

The Yugoslav army uses two types of 128-mm (5.04-in) MRL, the 32-round towed **M-63 Plaman** and the truck-mounted 32-round **YMRL-32 Oganj**. The former was developed in the late 1950s and early 1960s, and is mounted on a split-trail carriage. It fires the 8.6-km (5.34-mile) range spin-stabilized M-63 rocket, which is 0.81 m (2.66 ft) long, weighs 23.1 kg (50.93 lb) and has a 7.6-kg (16.75-lb) HE-fragmentation warhead. An improved version with a wider carriage has also been built, while both 16-round and 8-round variants are available for export on carriages or vehicle mounts if required.

The YMRL-32 (a NATO designation in the absence of the official Yugoslav designation) was developed in the early 1970s and is based on the FAP2220BDS 6×6 truck fitted with a 32-round launcher and a reload pack of 32 rounds on the rear platform. The rocket fired by this system is of a newer type, 2.6 m (8.53 ft) long, 65 kg (143.3 lb) in weight with a maximum range of 20 km (12.43 miles) and an HE-fragmentation warhead weighing 20 kg (44 lb). Reloading of the tubes takes approximately two minutes when using the reload pack.

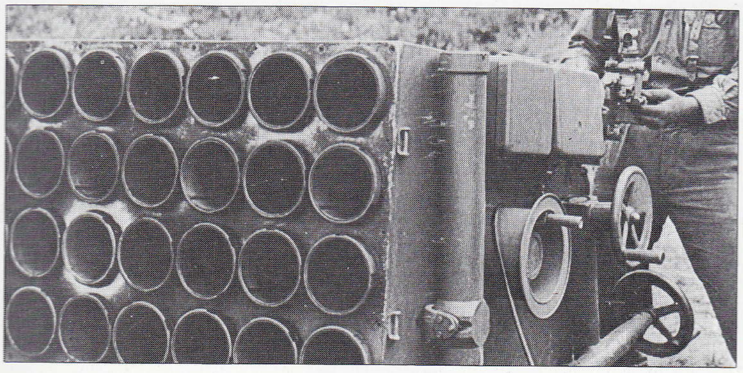
The M-63 is normally found in battalions of three batteries, each with four launchers, while the YMRL-32 is found in batteries of six vehicles. It is believed that both systems have been exported, but the only known user outside Yugoslavia is Cyprus, which has a few YMRL-32 systems.

Specification

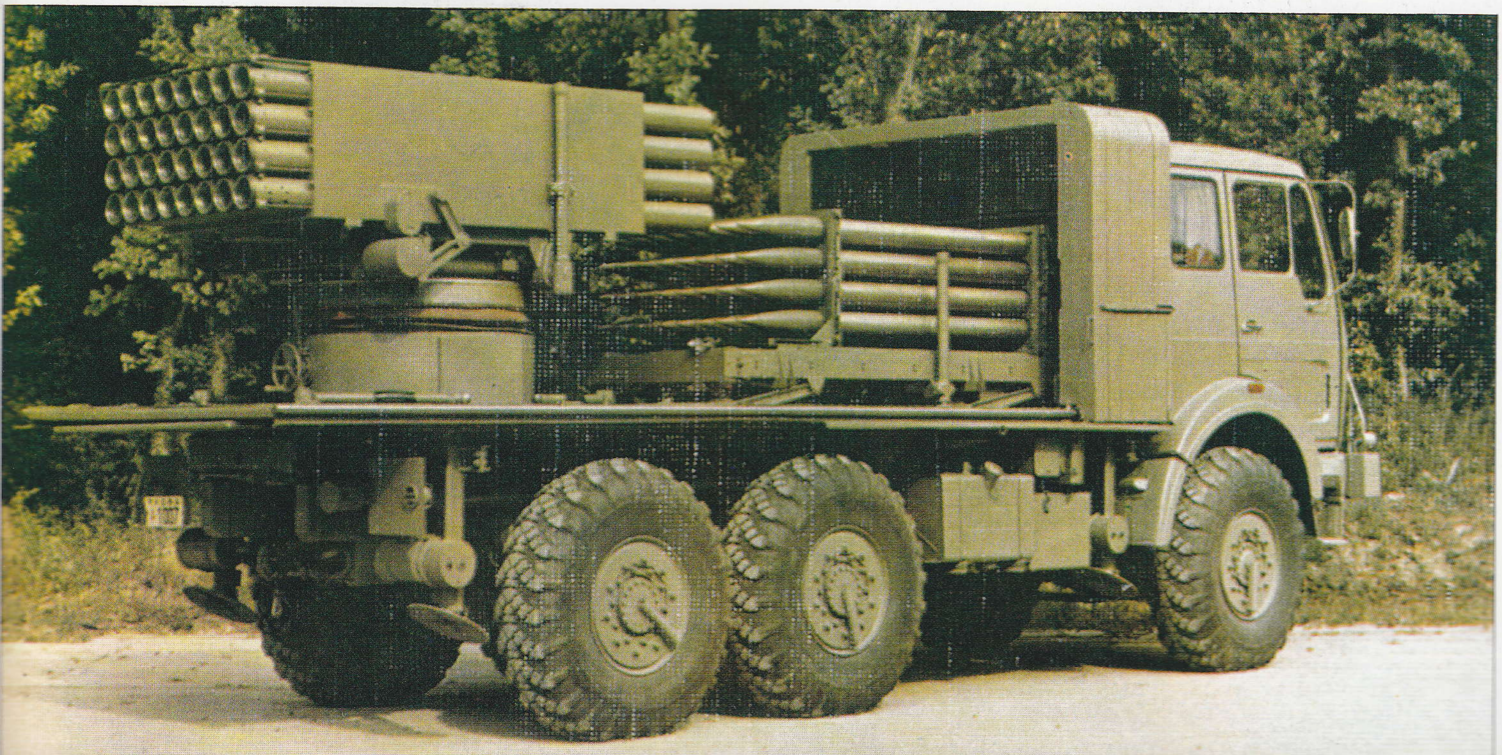
M-63
Combat weight: 2134 kg (4,705 lb)
Crew: 3-5
Chassis: two-wheeled trailer
Calibre: 128 mm (5.04 in)
No. of launcher tubes: 32
Length of rocket: 0.81 m (2.66 ft)
Weight of rocket: 23.1 kg (50.93 lb)
Warhead type: HE-fragmentation
Warhead weight: 7.6 kg (16.75 lb)
Maximum range: 8.6 km (5.34 miles)

YMRL-32
Combat weight: (estimated) 13000 kg (28,660 lb)
Crew: 6
Chassis: 10000-kg (22,046-lb) FAP 2020BS 6×6 truck
Calibre: 128 mm (5.04 in)
No. of launcher tubes: 32
Length of rocket: 2.6 m (8.53 ft)
Weight of rocket: 65 kg (143.3 lb)
Warhead type: HE-fragmentation
Warhead weight: 20 kg (44 lb)
Maximum range: 20 km (12.43 miles)

The 128-mm (5.04-in) M-63 Plaman multiple rocket launcher is used in battalions of three batteries, each with four launchers, to support Yugoslavian infantry units.



Although supplied with many weapons by the Soviet Union, Yugoslavia chose to develop the YMRL 32 Oganji 128-mm (5.04-in) multiple rocket launcher on the FAP 2220BDS 6×4 truck chassis as its standard self-propelled system. It is used by the army's armoured and mechanized units.



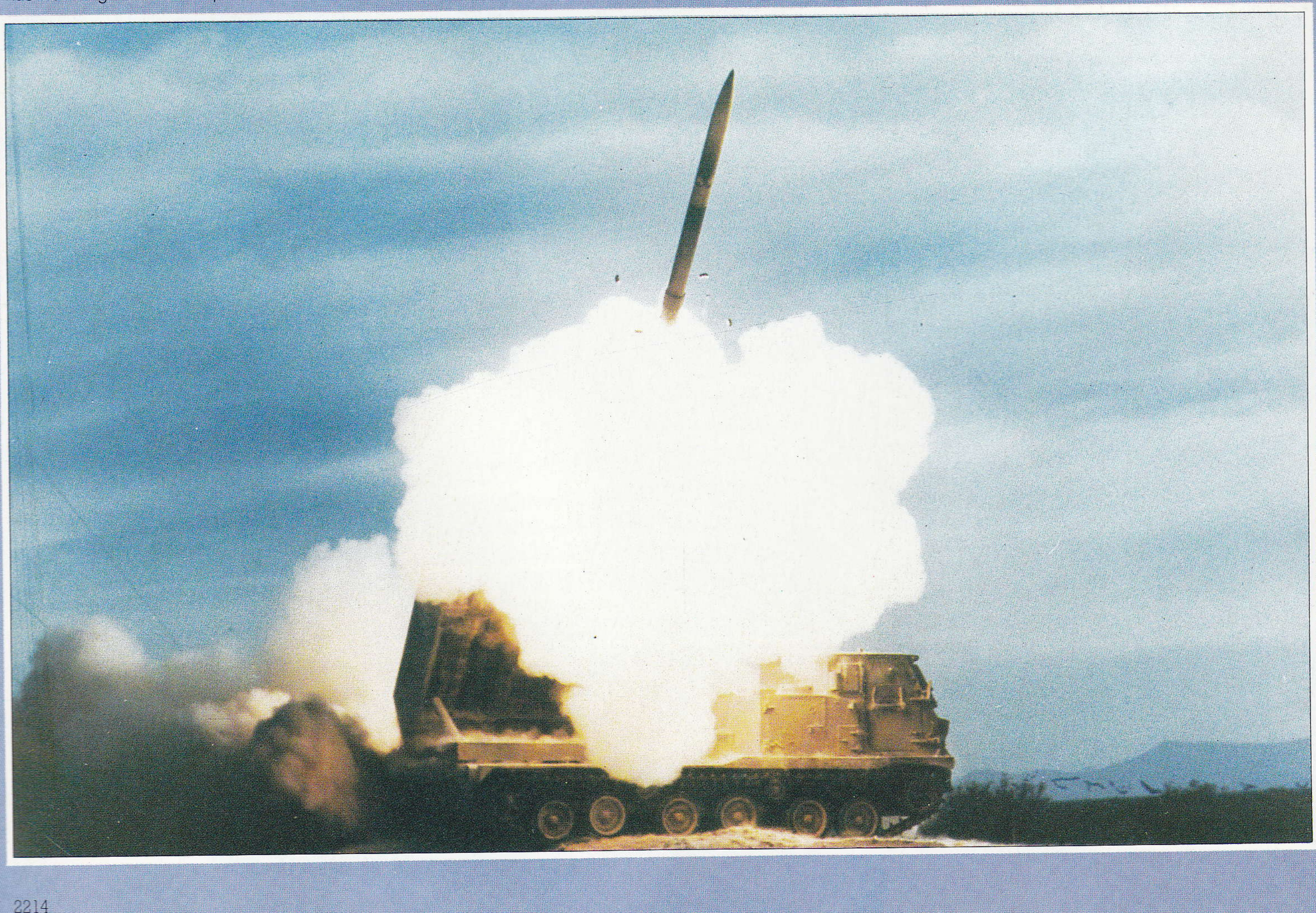
A Bigger Bang for the Russians ?

The Soviet multiple rocket-launchers are relatively cheap, simple and, above all, numerous. This enables them to deliver an incredible deluge of fire, which will probably include toxic blood agents like hydrogen cyanide. By contrast, the US MLRS is a sophisticated design, too expensive to be bought in quantity by NATO armies.

The definition of multiple rocket-launchers (MRLs) is given by the Soviets, who say that they are a collective fire system which can serve to annihilate enemy troop and equipment concentrations in both the offensive and defensive situation. The standard Soviet wartime MRL was the BM-13, which was given the nickname 'Katyusha' by the troops. This was a 9-km (5.59-mile) range 132-mm (5.2-in) calibre system mounted on the back of a lorry and fired 16 HE-fragmentation rockets from eight I-shaped rails in an over-and-under arrangement. Although long obsolete, the BM-13 remains in front-line service with some armies, and is known to be still in use by the Soviets as a training system. Rocket-launchers are viewed by the Soviets as a supplement to their tube artillery, and in the 1950s they switched from the relatively simple BM-13 to the launcher tubes of the 140-mm (5.5-in) BM-14 series. For massed fire at divisional and army levels the 12-round 240-mm (9.45-in) calibre 11-km (6.8-mile) range BM-24 (in both truck and tracked vehicle variants) was introduced in the late 1950s.

However, both systems were supplemented by the large four-round 200-mm (7.87-in) calibre BMD-20 with a range of 20 km (12.4 miles) and by the even bigger six-round 250-mm (9.84-mm) calibre BMD-25 with a range in excess of 30 km (18.6 miles). Both of these, together with the older BM-14 and BM-24 systems, were replaced from 1964 onwards at practically all levels by the truck-mounted 40-round 122-mm (4.8 in) calibre BM-21 with a range of 20.38 km (12.66 miles). Although a smaller-calibre rocket than its predecessors, the BM-21 round is in fact longer ranged than all bar the BMD-25, and is certainly more powerful than the main 140-mm calibre rocket. In fact each 122-mm rocket has a greater explosive punch than a 122-mm howitzer shell since it does not need the shell's thick casing and hence can carry more explosive. Like all contemporary rocket designs it is of the single-stage solid-fuel type with a 'fin and spin' stabilization system. The fins pop out after firing from the tube, which has helical grooves to impart a slow rate of spin.

The Soviets use their MRLs as additional fire support systems to back up the more conventional tube artillery. A battalion of BM-21s can deliver more explosives in one salvo than a battalion of artillery firing continuously for half an hour.



The political muscle of Western industry seems to prevent the development of a cheap but effective system in the Soviet style. The MRLS seen here is little better than the BM-27, yet far costlier, so it cannot be used in the large numbers needed to realize its true potential.

The Soviets then standardized on the 122-mm calibre as their main rocket type, producing a number of different launch platforms to carry it. They have only just abandoned it with introduction of the 16-round 220-mm (8.66-in) BM-27 with a range of over 40 km (24.9 miles) at the higher command levels (to provide support for the Operational Manoeuvre Groups) in the form of HE-fragmentation, submunition and chemical warheads.

Surprisingly, of the NATO nations ranged against the Warsaw Pact the only countries which have endeavoured to provide their own MRL support are West Germany, Spain, France and Italy. In the case of the latter two the systems ended up on the export market and were not ordered by those countries' armies. It needed the American-inspired MLRS project, and the realization that what the Soviets had been saying for years about MRLs was in fact true, to bring these countries and a number of other NATO members to purchase such systems.

Soviet superiority

Differing from the Soviets in having a tracked carrying platform, the MLRS is expected to provide long-range fire support against Soviet troop and armour concentrations with a variety of warhead types including a special binary chemical nerve gas type. However, the numbers actually to be procured are still considerably less than the total number of MRLS deployed by the Warsaw Pact, which prompts the question of why a cheaper and smaller-calibre system is not being developed for lower-echelon use, based perhaps on a modified air-to-surface rocket. Unfortunately it seems that if the system is not high-technology with large monetary rewards, then the constructing companies do not wish to know. For NATO's purposes this is counterproductive, because the armies involved must have come to realize what the Soviets have been preaching for years about military equipment (the simpler the system the easier it is to maintain and the better the combat efficiency) is essentially correct. It is no good having the most sophisticated weapon system available if it spends most of the time it is in service undergoing maintenance. Also, the cheaper the weapon the greater the number that can be purchased and the more nations within the NATO organization that can afford it. A straight comparison between the MLRS and the BM-27 shows that both have been designed for essentially the same role. Both are comparable in range, calibre and warhead types, yet the Soviet system has four more launch tubes and is mounted on a high-mobility truck chassis which is standardized within a number of Warsaw Pact armies. In contrast the MLRS is mounted on a modified IFV tracked chassis which only the US Army has in service. The BM-27 is integrated into the Soviet heavy artillery units to supplement the tube artillery, while most of the MLRS users will in fact use it to replace some artillery pieces. Finally, in terms of cost the high-technology approach to the MLRS makes it a much more expensive system than the BM-27. Although in operational terms the MLRS is better, it is actually the Soviets and the Warsaw Pact who are getting a better deal overall.

In the Soviet arsenal the MRL has found an important place in the offensive chemical warfare scenarios, where a single battery can deliver a larger quantity of persistent or non-persistent agent in a shorter space of time than can more conventional tube artillery.

The modern approach to MRL design by many countries is to produce a basic modular design such as the Brazilian Astros II, seen here firing an SS-60 rocket, whereby the number of launcher tubes and even the type of rockets fired can be varied.

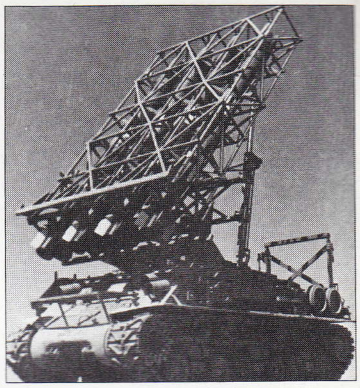
ISRAEL

IMI multiple rocket launcher

Work on the Israeli 290-mm (11.42-in) medium artillery rocket began in 1965 and the system entered service in the 1970s as a four-round frame launcher mounted on a Sherman tank chassis. Used in combat during the 1982 'Peace for Galilee' Israeli invasion of Lebanon, this **Israel Military Industries MRL** is now being mounted on converted Centurion MBT chassis in a new four-round tube launcher arrangement. The Centurion has a crew of four, who take cover within the vehicle for firings. A full salvo takes less than 10 seconds to be fired, the launch vehicle then moving to a prearranged location for reloading from a supply truck. The reloads are first lowered to the ground and placed on a special frame by the truck's crane. The Centurion then positions itself and hydraulically lifts the frame to the same height as the launch tubes and slides the rockets into the tubes. This entire operation takes only 10 minutes, the Centurion operations being controlled by only one man. The warhead used is of the HE-fragmentation type although submunition types are known to have been developed and used in combat against Syrian air-defence systems.

Specification

IMI MRL
Combat weight: 50800 kg (111,995 lb)
Crew: 4
Chassis: Centurion MBT
Calibre: 290 mm (11.42 in)
No. of launcher tubes: 4
Rocket length: 5.45 m (17.88 ft)
Rocket weight: 600 kg (1,322.8 lb)
Warhead types: HE-fragmentation, submunition
Warhead weight: 320 kg (705.5 lb)
Maximum range: 25 km (15.5 miles)

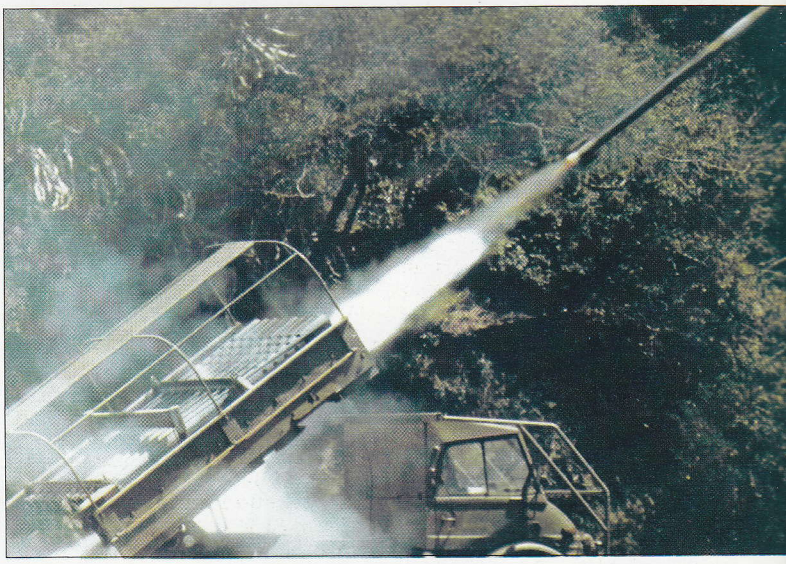


The original version of the Israel Military Industries 290-mm (11.42-in) Medium Artillery Rocket System is seen mounted on a Sherman tank chassis in a four-round frame rack. The current version employs cylindrical counter-launcher tubes on a Centurion MBT chassis.

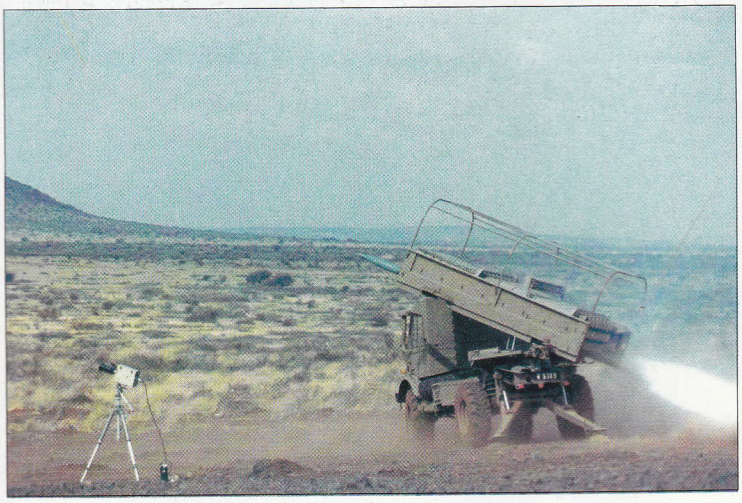
SOUTH AFRICA

Valkiri multiple rocket-launcher

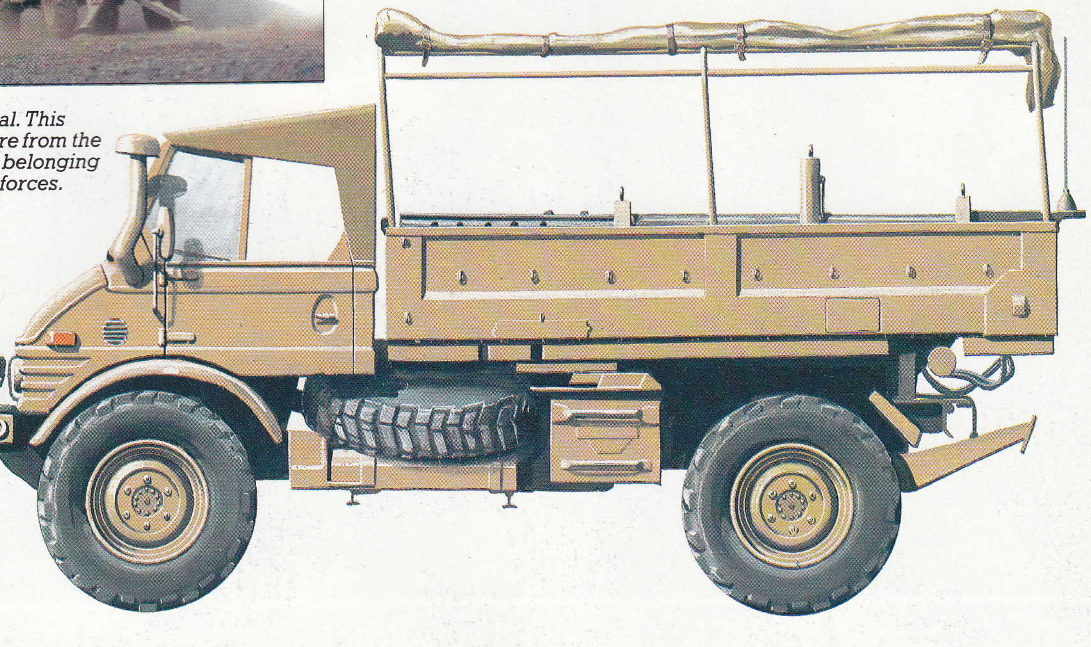
Development of the 127-mm (5-in) **Valkiri** started in 1977 as a counter to the Soviet 122-mm (4.8-in) BM-21 MRLs and other long-range artillery pieces in service with neighbouring African countries. The first systems entered service in late 1981 with the South African army, and are deployed with artillery regiments in batteries of eight launchers that are tasked either to work on their own or with more conventional tube artillery to attack area targets such as guerrilla camps, troop or artillery concentrations, and soft-skinned vehicle convoys. The system consists of a 24-round launcher mounted on the rear hull of a 4×4 SAMIL truck chassis with overhead canopy rails so as to make it appear to be just a normal truck when travelling. A second 5-ton truck with 48 reload rounds is assigned to each Valkiri. The full load of 24 rounds can be fired in 24 seconds, reloading taking about 10 minutes. The solid-propellant rocket is fitted with an HE-fragmentation warhead filled with some 3,500 steel balls to give a lethal area of some 1500 m^2 (16,146 sq ft). The range can be varied from a minimum of 8 km (5 miles) to a maximum of 22 km (13.67 miles) depending upon which spoiler rings are fitted to the rocket body.



Above: The highly mobile Valkiri is ideally suited for the South African mechanized cross-border raids against SWAPO guerrilla bases and Angolan army units deep within Angola itself.



The launch signature of the Valkiri is minimal. This helps the system to avoid counter-battery fire from the long-range Soviet-supplied artillery pieces belonging to surrounding African states and guerrilla forces.



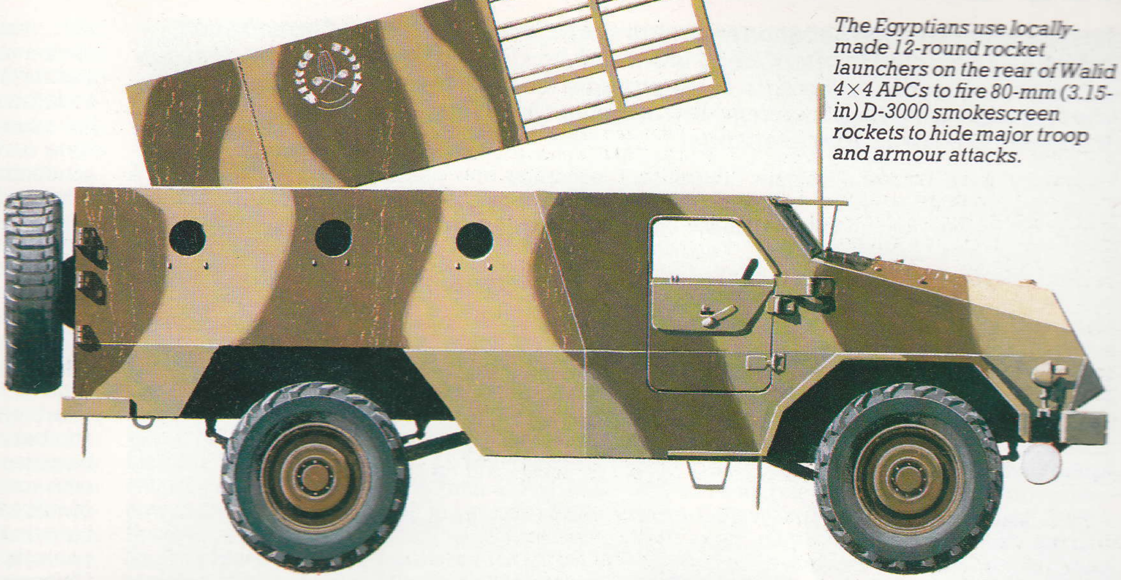
Below: Overhead canopy rails are fitted to the Valkiri launcher in order to camouflage the vehicle to appear as a normal South African Army SAMIL 20 4×4 light truck. With the canopy down it is almost impossible to tell the difference.

Specification

Valkiri
Combat weight: 6440 kg (14,198 lb)
Crew: 2
Chassis: 2200-kg (4,850-lb) SAMIL 20 4×4 truck
Calibre: 127 mm (5 in)
No. of launcher tubes: 24
Rocket length: 2.68 m (8.79 ft)
Rocket weight: not known
Warhead type: HE-fragmentation
Warhead weight: not known
Maximum range: 22 km (13.67 miles)

EGYPT

Egyptian multiple rocket-launchers



The Egyptians use locally-made 12-round rocket launchers on the rear of Walid 4×4 APCs to fire 80-mm (3.15-in) D-3000 smokescreen rockets to hide major troop and armour attacks.

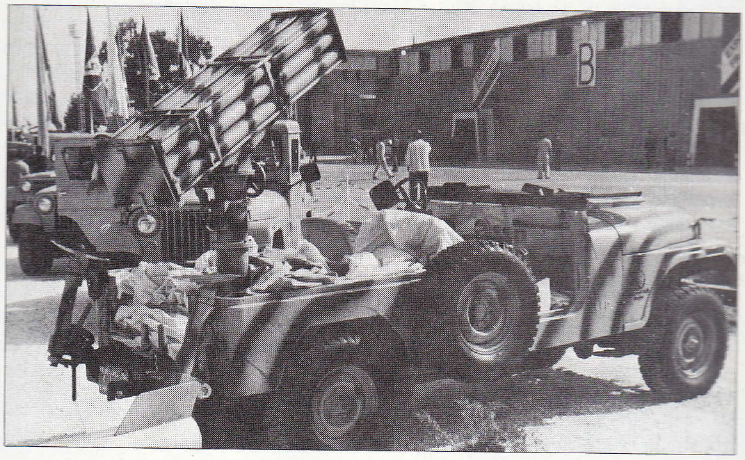
The Egyptian arms industry produces copies of the Soviet 132-mm (5.2-in) rocket for the army's elderly BM-13-16 Soviet systems and 122-mm (4.8-in) rockets for its BM-21 systems. It has also reverse-engineered the latter to produce a new 30-round launcher mounted on a Japanese 2500-kg (5,512-lb) Isuzu 6×6 truck chassis as well as the more usual 40-round version on a Soviet 3500-kg (7,716-lb) ZIL truck. The former is very similar in appearance to the North Korean BM-11 variant of the BM-21, which is mounted on the same chassis.

In addition to the reverse-engineered models two new systems have also been designed and built for the Egyptian army. These are the 122-mm calibre **Sakr-18** and the 122-mm calibre **Sakr-30** MRLs. The former has a range of 18 km (11.18 miles) and is built in 21-round, 30-round and 40-round versions mounted on lorry chassis types. It utilizes a 3.25-m (10.66-ft) long, 67-kg (147.7-lb) weight rocket fitted with a 21-kg (46.3-lb) submunition warhead containing either 28 anti-personnel or 21 anti-tank bomblets.

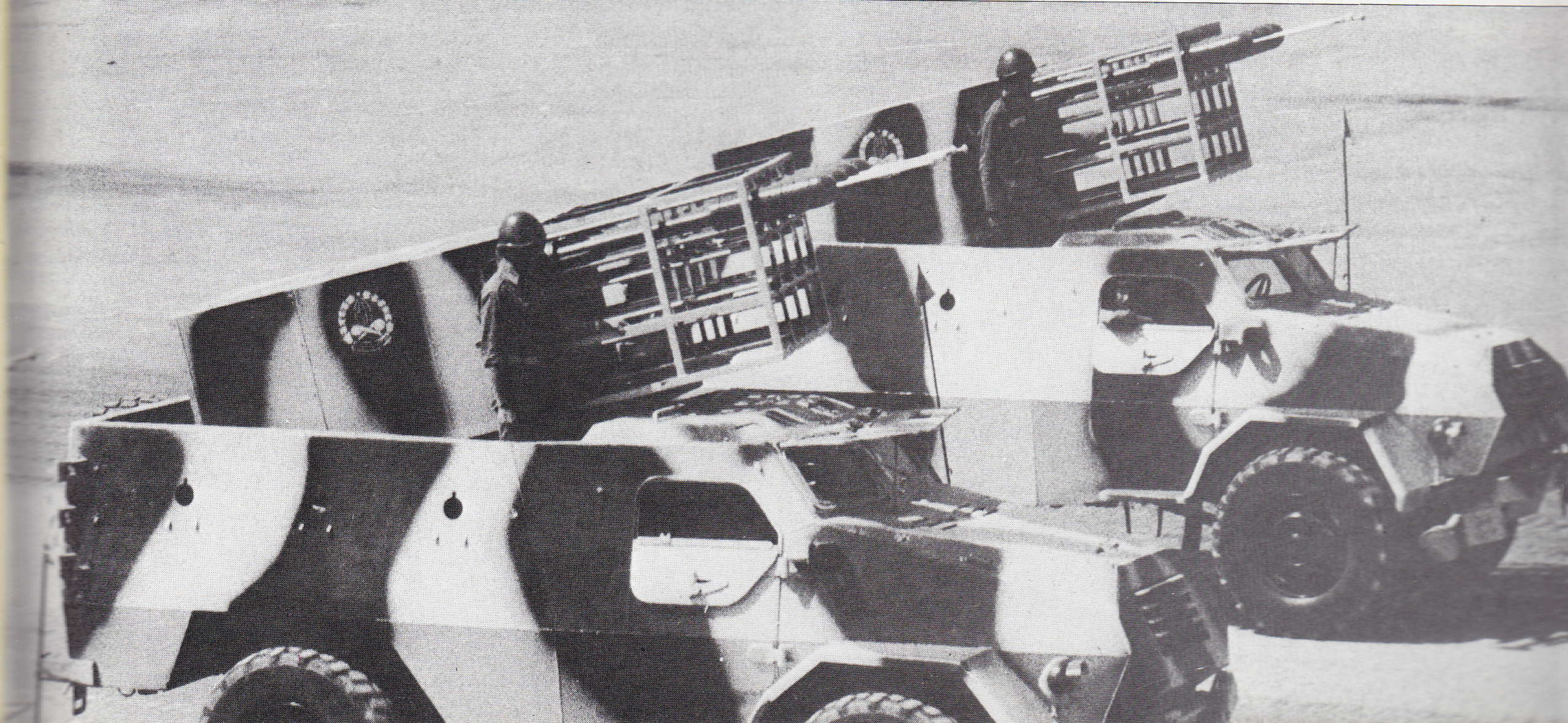
The Sakr-30 has a range of 30 km (18.64 miles) and fires three types of rocket which vary in length from 2.5 m (8.2 ft) to 3.16 m (10.37 ft). The longest weighs 63 kg (138.9 lb) and carries a 24.5 kg (54-lb) warhead which delivers five anti-tank mines. The medium-length round at 3.1 m (10.17 ft) weighs 61.5 kg (135.6 lb) and carries a submunition-dispensing 23-kg (50.7-lb) warhead with either 28 anti-tank or 35 anti-personnel bomblets as payload. The anti-tank bomblet is the same as that used in the SAKR-18, and can pierce over 80 mm (3.15 in) of armour, while the anti-personnel bomblets of both systems are lethal to a radius of 15 m (49.2 ft) from the point of detonation. The smallest round weighs 56.5 kg (124.6 lb) and has a basic 17.5-kg (38.6-lb) HE-fragmentation warhead. The increased range over the BM-21 and SAKR-18 systems has been achieved by using an improved lightweight rocket motor and case coupled with a new composite bonded star-grain propellant instead of the standard Soviet double-base grained propellant used in the shorter-range systems.

For infantry and anti-guerrilla use the 12-round 80-mm (3.15-in) **VAP** light vehicle-mounted MRL has been produced. This is mounted on a pedestal which is fitted in the rear of a 4×4 jeep-type vehicle and is fired by remote control. The 1.5-m (4.92 ft) long 12-kg (26.5-lb) fin-stabilized rocket can be fitted with either a HE-fragmentation or an illuminating warhead. The maximum range is 8 km (5 miles).

There is also a specialized system for laying down smoke screens. This can be found either as a 12-round rectangular frame launcher in the rear of a Walid 4×4 wheeled APC or as quadruple box-like launchers mounted on each side of a T-62 MBT turret. The rocket fired in both cases is the 80-mm (3.15-in) calibre 1.51 m (4.95 ft) long D-3000 which can form a smoke screen that lasts up to 15 minutes. A full 12-round salvo from a Walid can form a 1000-m (3,281-ft) long smoke screen of sufficient thickness and duration to cover most actitivies.



Right: An Egyptian army VAP-80 light vehicle mounted 80-mm (3.15-in) rocket launcher system with the 12-round launcher elevated to the firing position. The 12-kg (26.6-lb) rocket has a range of 8 km (5 miles).



Below: Walid APCs of the Egyptian army parade through Cairo carrying 12-round rocket launchers. These can fire a salvo of smoke rockets to create a smokescreen up to 1000 m (1,094 yards) long, which can last 15 minutes in favourable wind conditions.

Rockets in Lebanon

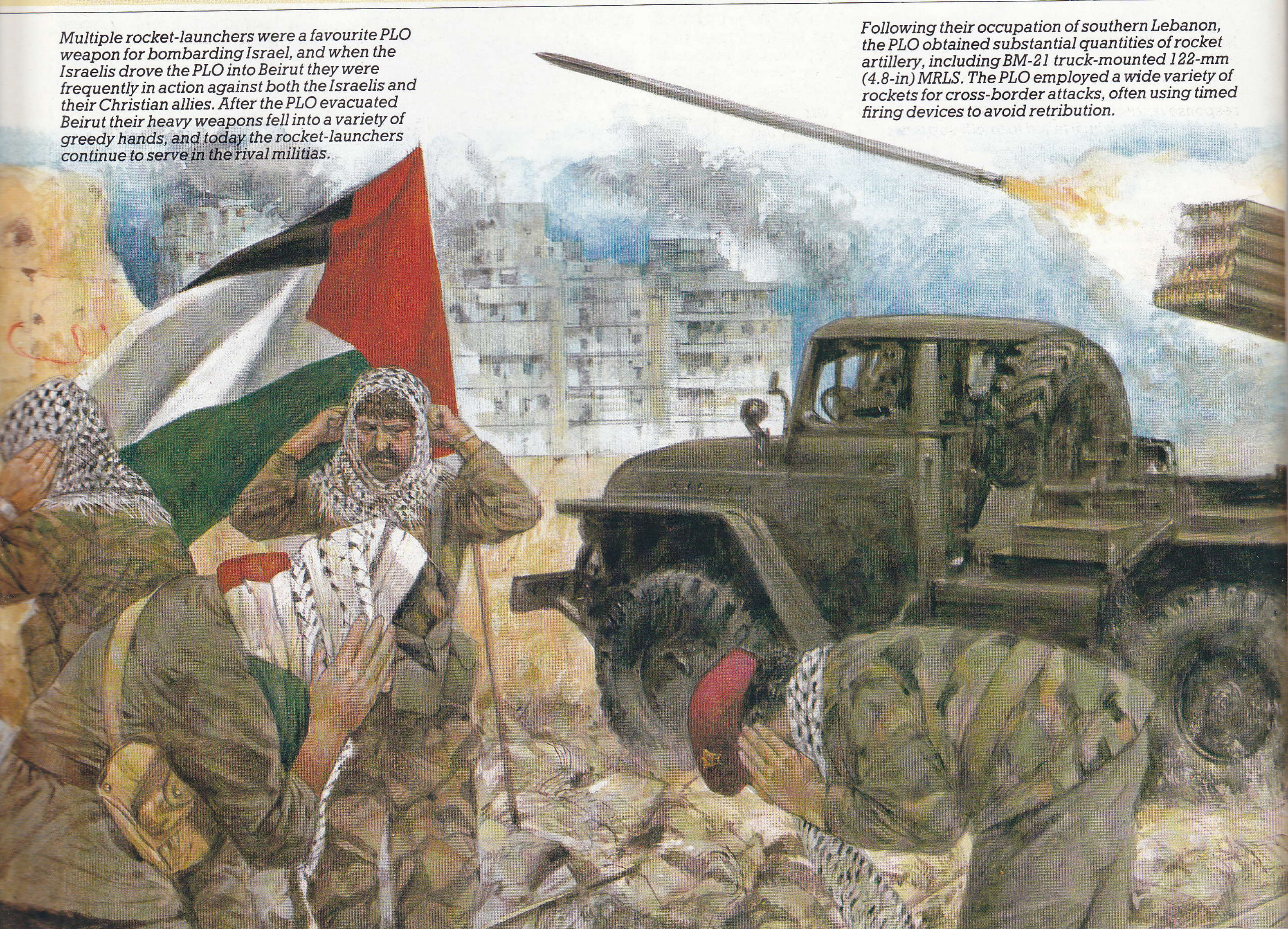
In 1982 Israel invaded Lebanon to destroy the Palestine Liberation Organization, which had occupied territory along the Israeli border and periodically fired salvoes of rockets at Israeli settlements. In the struggle that followed, rocket-launchers of the PLO were used both to defend Beirut against Israel and to settle factional battles inside the war-torn Lebanese capital.

Originally used by the Palestine Liberation Organization (PLO) against Israeli settlements across the Jordan river and the Lebanese border, Soviet- and Chinese-supplied 'Katyusha' rockets eventually precipitated the long drawn out 'Peace for Galilee' invasion of southern Lebanon in late 1982. In the early years of the cross-border bombardments the PLO used mainly single-round conversions of the 122-mm (4.8-in) BM-21 launcher. The 22-kg (48.5-lb) tube was mounted on a 28-kg (61.7-lb) tripod, each component normally being manpacked to the chosen launch site. The attackers then reassembled the launcher and fired a few rounds before packing up and moving on to another site or returning to their base. This particular system was backed up by single-round 140-mm (5.5-in) and 107-mm (4.2-in) rockets which were fired from simple frame cradles. These had the advantage over the tube launcher of the 122-mm system that a number of them could be set up together on earth ramps, pointing in the general direction of the target, and then be wired into a central control unit which could be fitted with a delayed-action timer. This allowed the crew to disperse before the rockets were fired, thus effectively escaping any possible retaliatory action. A number of these 'Katyusha' fields were discovered by the Israelis before the timer activated the rockets.

Palestinian weapons

After their occupation of the southern part of Lebanon following their withdrawal from Jordan in the post-1970 civil war period, the Palestinians were able in the late 1970s and early 1980s to obtain vast shipments of weapon systems which included truck-mounted Soviet 40-round BM-21 and North Korean 30-round BM-11 122-mm MRLs. The increased mobility and firepower of these systems, together with the use of well-concealed launch sites, allowed a full salvo from a truck-mounted launcher to be fired against an Israeli *kibbutz* within a minute or so. The effect of the devastation caused and the continuous sound and fury of the almost nightly attacks on the Israeli population centres can well be imagined, and this PLO tactic forced the people living within 'Katyusha' range of the border to spend each night in specially constructed communal air-raid shelters for safety. Even so, casualties were high enough to be one of the primary causes for the 1982 invasion of Lebanon. The aim of this operation was to eliminate the PLO menace once and for all from the region. However, it also ended as a direct military confrontation with the armed forces of Syria and entailed an advance on Beirut with the ruthless and much-condemned bombardment of the city and its surroundings before the aim was accomplished. The advance also allowed the Israeli army to use its own MRL systems (the 240-mm/9.45-in modified BM-24, the 290-mm/11.4-in Medium Artillery Rocket and the 160-mm/6.3-in Light Artillery Rocket systems) to bombard Palestinian positions and fortified villages and also Syrian troop and equipment concentrations.

In the vicinity of Beirut itself the PLO used a number of locally designed and built 122-mm launcher systems. These included six- and nine-round launchers taken from dismantled BM-21 MRLs and mounted on the back of 4×4 light trucks with simple elevation and azimuth controls. They also modified the 12-round Chinese-built 107-mm Type 63 launcher by taking it off its trailer and fitting it onto a pedestal mount on the rear of the same light truck models. These conversions allowed the PLO units in Beirut to mount highly effective hit and run attacks against Israeli positions from within the labyrinth of streets that comprise Moslem West Beirut. The more conventional Type 63 launcher was also used, but this was generally in static positions which were well fortified.



Multiple rocket-launchers were a favourite PLO weapon for bombarding Israel, and when the Israelis drove the PLO into Beirut they were frequently in action against both the Israelis and their Christian allies. After the PLO evacuated Beirut their heavy weapons fell into a variety of greedy hands, and today the rocket-launchers continue to serve in the rival militias.

Following their occupation of southern Lebanon, the PLO obtained substantial quantities of rocket artillery, including BM-21 truck-mounted 122-mm (4.8-in) MRLS. The PLO employed a wide variety of rockets for cross-border attacks, often using timed firing devices to avoid retribution.

The PLO's 'mobile artillery' also comprised large numbers of light 4×4 trucks fitted with 14.5-mm (0.57-in) single ZPU-1, twin ZPU-2 and quadruple ZPU-4 heavy anti-aircraft machine-guns and a smaller number of heavier 6×6 trucks and BTR-152 wheeled APCs carrying a twin 23-mm ZU-23 automatic anti-aircraft cannon mounted on the rear for use in the ground-to-ground role as well as their more normal air-defence duties. There were also a number of ex-Syrian army armoured vehicles, including T-34 medium tanks with the 85-mm (3.35-in) gun, T-54 and T-55 main battle tanks with 100-mm (3.94-in) guns, BRDM-2 armoured cars and a small number of early model ZSU-23-4 'Shilka' self-propelled anti-aircraft gun vehicles, which were used in the street fighting. The tactics adopted by the PLO and friendly Moslem factions of continually moving the heavy weapons after launching short sharp attacks ensured that the Israelis could never win a total ground victory in Beirut, and forced the Israelis into the massive use of their overwhelming firepower, in the form of air and artillery strikes on an almost continuous basis to suppress the fire incoming from various parts of the city and to reduce their own military casualties as far as possible. This response, as in most previous wars where large-scale urban fighting has taken place, resulted in considerable casualties amongst the innocent civilian population and in mounting external and internal political pressures on the Israeli government to end the battle. Finally after several weeks of combat the Israelis won a partial victory when the PLO negotiated an evacuation of its fighters from the city; with that came the breaking of the PLO hold on southern Lebanon.

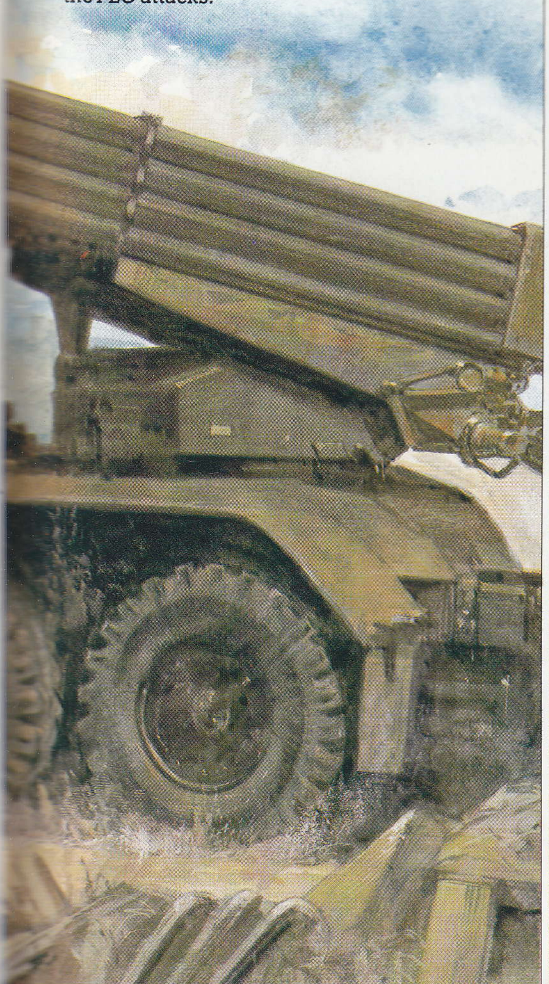
Beirut: a multi-storey battlefield that defies all international attempts at peacemaking. The multitude of warring factions are armed to the teeth and equally intransigent; the struggle continues in a seemingly endless exchange of car bombs, artillery duels and rocket attacks.

Unfortunately, in the months that followed the Israeli army also managed to alienate and make an even deadlier enemy for itself in the form of the indigenous and deeply religious Shi'ite Moslem population. There followed a particular bitter guerrilla campaign, including the use of suicide car bombers against military convoys, forcing the Israelis to withdraw to Israel because of the mounting casualty list in a war whose real purpose most Israelis were beginning to doubt in an apparent 'no-win' situation.

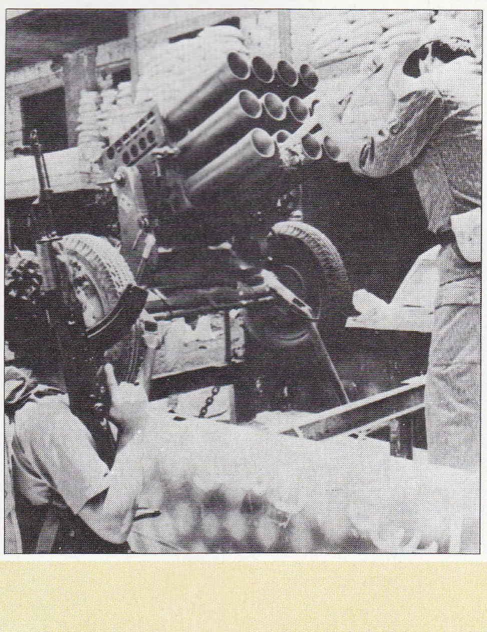
The final 'withdrawal' was marked by the first rocket attack on an Israeli northern settlement since the 1982 invasion, when two rounds landed harmlessly near an Israeli *kibbutz*.

Thus after three years of occupying southern Lebanon because of such acts the circle had been completed; the potential for another invasion along similar lines to 1982, with an even greater risk of full-scale war with Syria returned, but with a different yet even more dangerous enemy than the PLO.

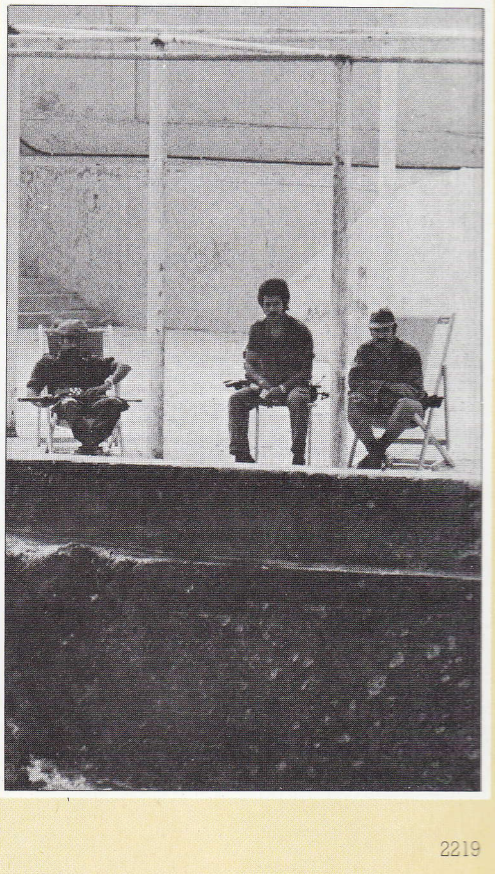
A 122-mm (4.8-in) rocket leaves the BM-21 launcher with a deafening roar at the beginning of a 40-round salvo. As soon as the last rocket has been fired, the PLO men will leap into the cab and vanish into the maze of streets. The Israeli response tended to be equally indiscriminate – aerial bombing, which failed to totally suppress the PLO attacks.



Many 107-mm (4.21-in) Type 63 towed rocket-launchers are in use with the various militia and guerrilla groups in Lebanon, as shown by this view of a Moslem militiaman of the Assad brigade cleaning a locally modified vehicle-mounted variant during a lull in the fighting on the Green Line in Beirut.



The tragedy of Lebanon continues with this formerly prosperous country splintered into warring factions. There is no effective government; only one law which overrides all other considerations – the law of the gun.



CHINA

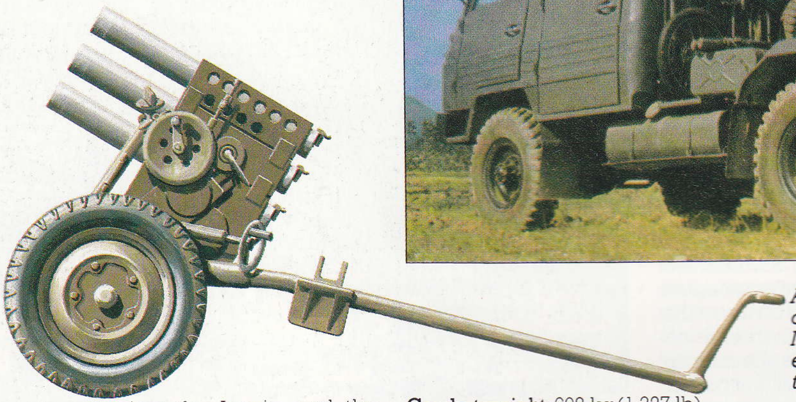
Type 63 and Type 81 107-mm multiple rocket-launchers

Developed in the late 1950s as the replacement for the 102-mm (4.02-in) six-round Type 50 MRL, the 107-mm (4.21-in) system is issued on the scale of 18 launchers per Chinese infantry division.

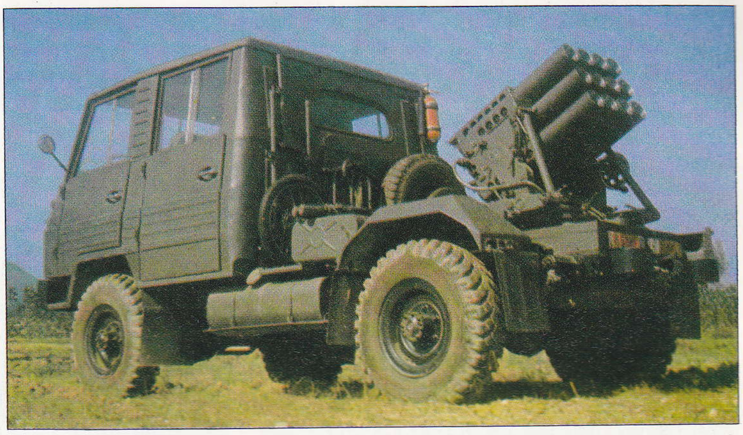
The basic **Type 63** 12-round launcher has three rows of four barrels and is mounted on a rubber-tyred split-pole trailer carriage. For firing the wheels are removed and the launcher is supported by two legs at the front and the two trails at the rear, the latter being fitted with spades. A lighter model is used by the Chinese airborne and mountain infantry units, and this can be dismantled into loads for carriage by men or horses.

To increase mobility the launcher can also be mounted on the rear of a 4×4 truck fitted with an enlarged cab to accommodate the crew of four and 12 reload rounds. The launcher can either be remote-fired from the vehicle or dismounted for use on its normal towing carriage. This variant is known as the **Type 81**.

The 107-mm systems have seen extensive combat service throughout the world, the Chinese having used them against the Vietnamese, the Vietnamese against the Americans, Chinese and Kampucheans, the Iranians against the Iraqis, and the Palestinians against the Israelis and Shi'ites, to name but a few. Both HE and incendiary rounds have been used.



Below: The 107-mm (4.21-in)12-round Type 63 rocket launcher is in widespread use with the People's Liberation Army. The rocket can also be fired on its own and is currently being used by the Afghanistan Mujahideen guerrillas.



Above: Type 81 is the Chinese designation for a Type 63 12-round MRL mounted on a 4×4 truck with an enlarged cab which accommodates the crew and 12 reloads.

Specification
Type 63

Combat weight: 602 kg (1,327 lb)
Crew: 4
Chassis: two-wheeled trailer
Calibre: 107 mm (4.21 in)
No. of launcher tubes: 12
Rocket length: 0.84 m (2.76 ft)
Rocket weight: 18.8 kg (41.45 lb)
Warhead types: HE-fragmentation, incendiary
Warhead weights: 8.33 kg (18.36 lb) and 7.54 kg (16.62 lb)
Maximum ranges: 8.5 km (5.28 miles) and 7.9 km (4.9 miles)

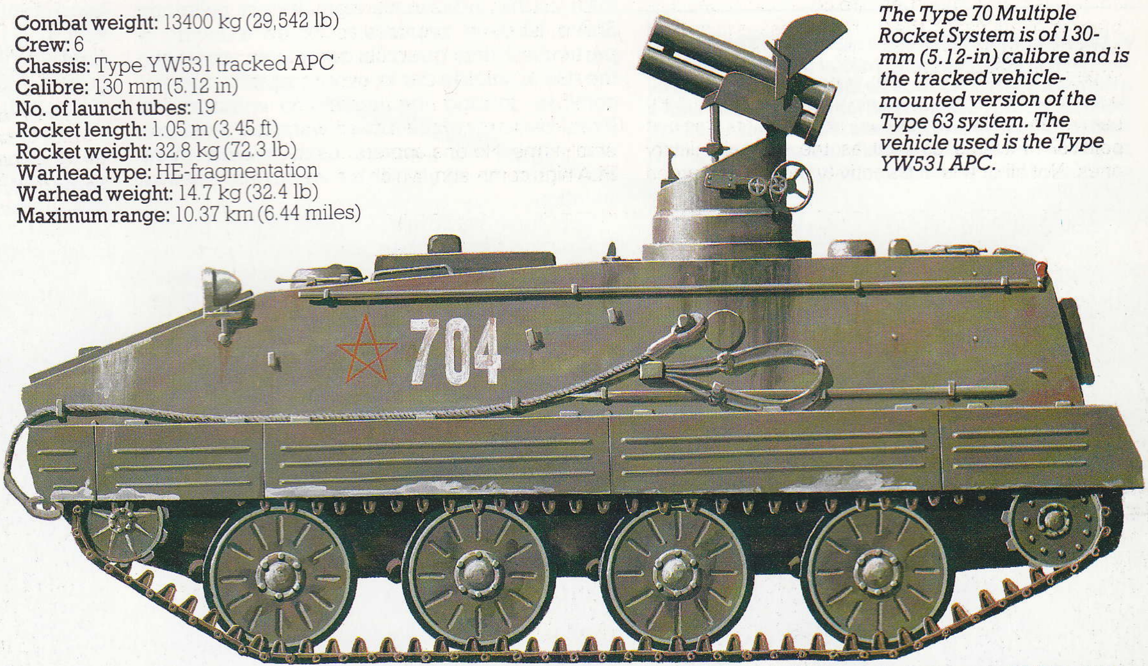
CHINA

Type 63 and Type 70 130-mm multiple rocket-launchers

The Chinese have indigenously designed and built two types of 19-tube 130-mm (5.12-in) calibre MRL systems, the **Type 63** mounted on the rear platform of the 2500-kg (5,511-lb) NJ-230 4×4 truck in two variants, and the **Type 70** mounted on the top of the Type YM531 tracked APC, to replace elderly Soviet systems. The major difference in the truck-mounted variants is that the second has a covered crew cabin. All three types are grouped into batteries of six launchers, the truck-mounted systems serving in the artillery's MRL regiments and the APC systems serving in the armoured divisions. The launch tubes are arranged in two rows, with a top one of 10 over a lower row of nine. Both systems are in production and have seen combat use with the Chinese and Vietnamese armies during their short border war in 1979. The North Korean army is also known to have the truck-mounted system in service, and may well be building it under licence in North Korean state arsenals as part of that country's arms-building programme.

Specification
Type 70

Combat weight: 13400 kg (29,542 lb)
Crew: 6
Chassis: Type YW531 tracked APC
Calibre: 130 mm (5.12 in)
No. of launch tubes: 19
Rocket length: 1.05 m (3.45 ft)
Rocket weight: 32.8 kg (72.3 lb)
Warhead type: HE-fragmentation
Warhead weight: 14.7 kg (32.4 lb)
Maximum range: 10.37 km (6.44 miles)



The Type 70 Multiple Rocket System is of 130-mm (5.12-in) calibre and is the tracked vehicle-mounted version of the Type 63 system. The vehicle used is the Type YW531 APC.

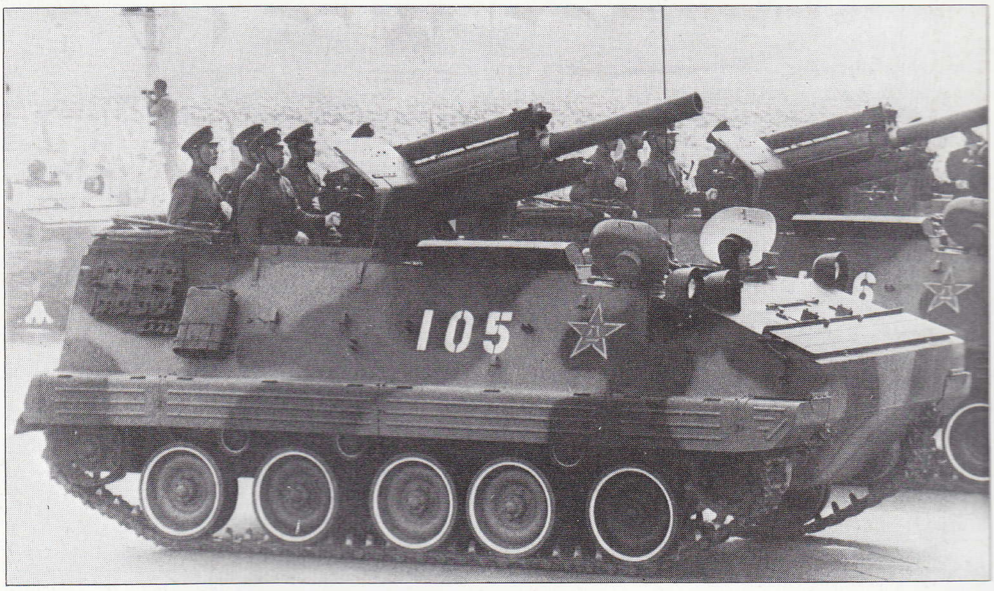
Above: A six-launcher battery of Type 70 130-mm (5.12-in) MRLs opens fire during a People's Liberation Army exercise. The Type 70 MRLs serve with armoured divisions, and the truck-mounted models with the infantry.

Below: The Type 70 carries 19 130-mm (5.12-in) rocket tubes on a YM531 APC chassis, and saw action in 1979 during the border clashes with Vietnam. North Korea has adopted the truck-mounted system, the Type 63.

China

Part 1

The People's Liberation Army



The Chinese People's Liberation Army was formed officially in June 1946, although it can trace its origins back to 1 August 1927, when Mao Zedong (Mao Tse-tung) was placed in command of the 1st Worker's and Peasant's Red Army. Even so it was 1 October 1949 before the Chinese People's Republic formally took over control of mainland China and the People's Liberation Army (PLA) changed from being a revolutionary force into a national army.

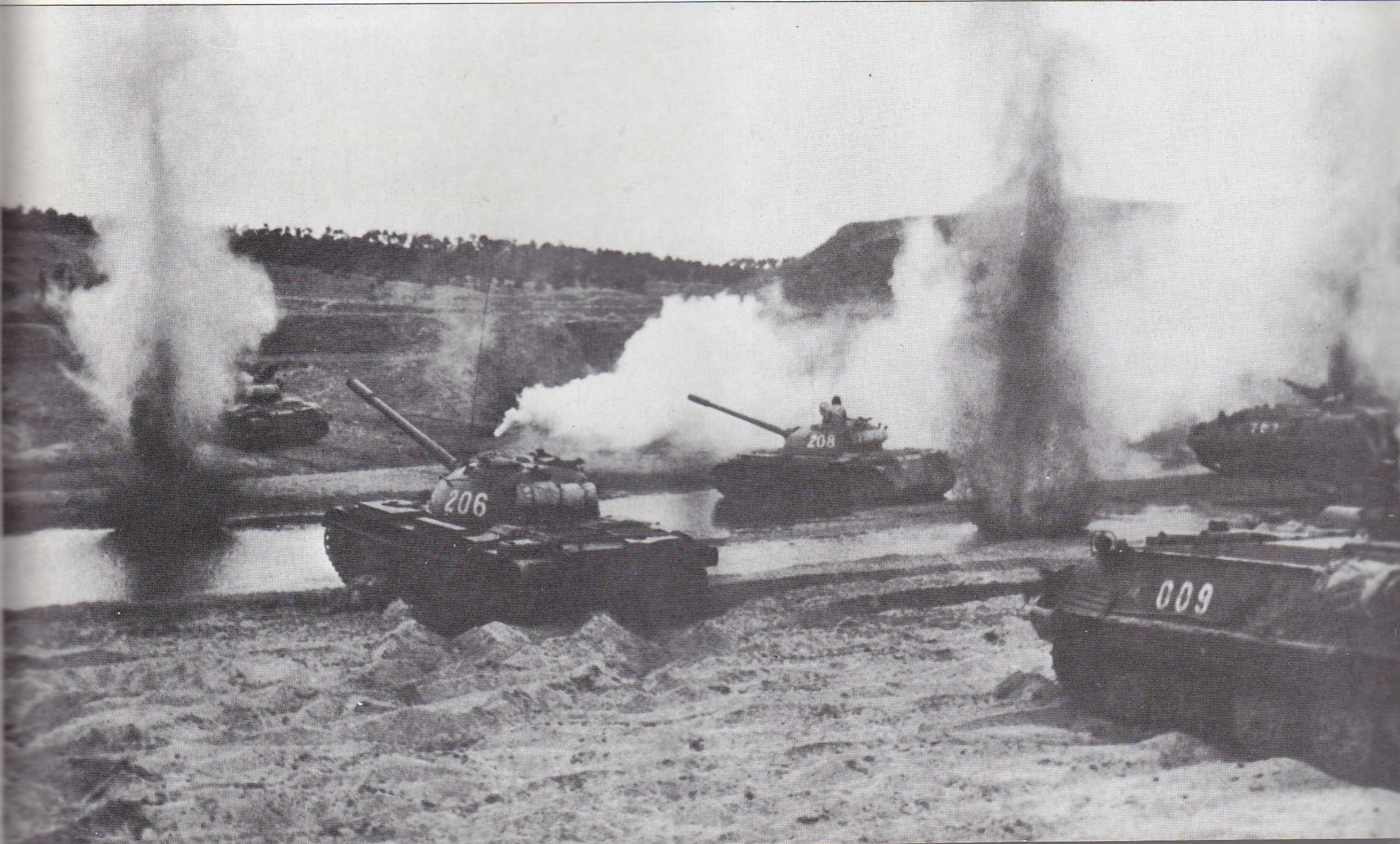
The term People's Liberation Army (PLA) encompasses not only the Chinese army but also the air force and the navy. In numerical terms the army is by far the largest force, having an estimated manpower strength of 3,160,000 compared with the air force's 490,000 and the navy's 362,000. Collectively the PLA is a defensive force that cannot be expected to make other than local military excursions for the simple fact that its numerical strength is not matched by the transport capacity that any large-scale move would require.

The army of the PLA is unlike any other conventional army, for not only does it have a purely military defensive function but several others as well. These functions include acting as a massive organized labour force that takes part every year in the gathering of harvests and the implementation of major civil engineering projects such as rail- and road-building and the provision of irrigation and canal schemes, often on a massive scale. The PLA acts in a political sense also: PLA members are constantly used as a method of educating the Chinese masses in current political thought, and internally the PLA constantly imparts the Communist party line to its own members. Education is another PLA activity, and it cannot be overemphasized that the PLA has economic and political functions as well as the normal military ones. Not all of this extra activity must be regarded as purely politically-motivated. The fact is that mainland China is now in a state of peace it has not known for centuries, and the nation is attempting to modernize and repair the ravages of over 60 years of constant war. In this the PLA has a paramount role.

Despite its massive strength in manpower, the PLA must still be regarded as somewhat lacking in weapon strength and mobility, both armoured and logistic. As will be related, only a small proportion of the PLA's strength is armoured, and the vast majority of the manpower is armed with little more than small arms. No one appreciates this more than the PLA high command, which is currently doing its best

The Chinese army has long relied on overwhelming numbers, but in recent years Beijing has recognized that China has fallen behind in weapons technology. After falling out with the Soviet Union in 1960, China has had to develop her own weapons and now offers some, like this Type 54-1 SP 122-mm howitzer, for export.

A combined arms force of T-59 tanks and Type 531 APCs storm across a river during recent PLA exercises. The T-59 is a Chinese copy of the Soviet T-54 and still equips the bulk of PLA armoured forces, despite the steady introduction of the T-69, an up-gunned version which China is also exporting to Iraq.



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to modernize and re-equip Chinese forces not only with modern weapons but with modern tactics. The Chinese have no wish to repeat the dreadful casualties they suffered as a result of their 'human wave' attacks in Korea during the early 1950s. They also have no wish to renew the Soviet influence that was dominant during the 1950s and from which much of their current armoury and operational philosophy originates. At present the PLA is undergoing a lengthy period of internal reorganization in which the former centralized organization of the PLA's main combat strength is being passed to the military regions.

The PLA is divided into the Main Force, the Local Forces, the Militia and a large number of other units including Border Guards, garrison units and various forms of support troops. These forces are currently organized into a series of 11 Military Regions, 27 Military Districts, one independent Military District and three Garrison Commands, but it is this structure that is currently being reorganized, so some alterations might well emerge in time.

The Main Force constitutes the main combat strength of the PLA. It is deployed in 35 armies (a PLA army may be regarded as an overstrength western corps), each army usually having three divisions (infantry), one artillery regiment and support troops. In addition some armies have added to their strength an independent tank regiment, an extra artillery regiment or an air-defence regiment. An indication of the operational imbalance that exists within the PLA can be seen in the fact that divided among the armies are 118 infantry divisions but only 13 armoured divisions.

The Local Forces come under the control of the Military Districts, a Military District usually following the boundaries of the local province. The Local Forces are regulars, and although they consist of some 73 divisions for border and internal defence (plus three garrison divisions) and about 140 independent regiments, they have no armoured formations and only limited light artillery.

To this formal regular strength must be added the Militias. Numerically the most important is the Common Militia, consisting of all members of the population of military age who are not serving with the armed forces. It has no military function other than acting as a labour force and as a source of recruits, and is unarmed. Then comes the Basic Militia, which numbers well over 20 million and receives a few days of military training each year but it is not normally armed. In time of war the Basic Militia would be expected to provide logistic assistance to the regular forces and form local-defence units, possibly for guerrilla operations. Then comes the Armed Militia, which is between five and seven million strong. As its name implies, it is armed and all members are provided with basic military training. Some are organized into local air-defence units.

Away from the purely military functions of the PLA there are a number of railway and other transport troops who operate the national communications network even in times of peace. In a similar fashion there are well over 50 independent engineer regiments and other units with a military function, but which normally carry out civil projects. There is even a Production and Construction Corps organized into corps and divisions in their own right. These come under PLA control and are among the units which organize and carry out factory and other production activities that range from food production to weapons manufacture.

Equipment

By any modern standard, the PLA is seriously under-equipped. Only the Main Force divisions have any armoured units or heavy artillery support, and there is an overall lack of heavy support weapons. The overall shortage of military transport of all kinds is a serious operational restraint and is only partially overcome by a reliance on the personal fitness of the individual soldier, who is trained to make long-distance route marches almost every week. This transport shortage imposes serious logistic problems for the PLA, which thus trains constantly to live off the country and to rely on its enemies for supplies, just as it did in the years before 1945. In peace the PLA relies on the local Military Region or District for day-to-day supplies of all kinds.

Even allowing for the above, the sheer numbers of weapons used by the PLA is rather overwhelming. Estimates put the numbers of armoured vehicles as high as 11,450 of all types. These numbers tend to conceal that most of them are obsolete ex-Soviet designs or Chinese copies of those same Soviet AFVs. Current types in service include T-54s and their Chinese versions (the Type 59 and Type 69). Numbers of ex-Soviet T-34s and IS-2s are still used, mainly for training. China is now making a determined effort to produce indigenous AFVs, and already in service are Type 62 and Type 63 light tanks plus Type 53 APCs. However, large numbers of ex-Soviet BR-152 and BTR-40/50/60 APCs still remain in use.

In artillery the Chinese have become more self-sufficient, but most of their gun park still displays weapons of Soviet origin. The largest calibre in use on any scale is 152 mm (6 in), and no larger support weapons are in service other than multiple rocket-launchers of various sizes. Other artillery include calibres of 122 mm (4.8 in), 100 mm (3.93 in) and 85 mm (3.34 in). Anti-tank guns are still used on a large scale as are various forms of anti-aircraft gun; one estimate places the number of air-defence guns as high as 15,000. Heavy mortars with calibres of 160 mm and 120 mm (6.3 in and 4.72 in) are used to bolster the artillery, as are well over 4,500 multiple artillery rocket-launchers of all calibres.

Infantry weapons are produced in China on a large scale. The basic service rifle is the Type 56, a copy of the Soviet 7.62-mm (0.3-in) AK-47 assault rifle. The rest of the infantry weapon inventory is also Soviet in origin or design, for the most part, and ranges from light machine-guns to general-purpose machine-guns, but of late some local designs of sub-machine guns and pistols have been issued. Infantry weapons are the main weapons of the PLA and militias, but only the Armed Militia is armed and then only with weapons that have been passed as obsolete by the rest of the PLA. Even so the scale of issue is such that not every member of the Armed Militia has a firearm. Many get only grenades, and they are expected to improvise their own land mines.

People's Liberation Army order of battle

Main Force

35 armies each with three infantry divisions, one artillery regiment and support troops formed from:
  118 infantry divisions
  13 armoured divisions
  17 field artillery divisions
  16 air-defence artillery divisions
  20 signal and chemical warfare regiments
  21 independent support regiments
  50 independent engineer regiments

Local Forces

70 infantry divisions for local/border defence
3 garrison divisions
140 independent regiments

Other Forces

Public Security Forces
People's Armed Police
Production and Construction Corps

Early model T-59s lacked main armament stabilization and infra-red night vision equipment, but more recent models made good these deficiencies and some have been seen with what is probably a laser rangefinder.